THE MEDICAL JOURNAL OF AUSTRALIA

VOL. I.—40TH YEAR SYDNEY, SATURDAY, JUNE 20, 1953 No. 25

Table of Contents.

[The Whole of the Literary Matter in THE MEDICAL JOURNAL OF AUSTRALIA is Copyright.]

ORIGINAL ARTICLES— Page.
Listerian Oration—The Fruits of Lister's Labours: Illustrated by an Account of the Surgery of Hydatid Cysts, by Howard Boyd Graham .. 869
Early Diagnosis of Cervical Carcinoma with Special Reference to General Practice, by R. Francis Matters, M.S., M.D., F.R.C.S., F.R.A.C.S., F.R.C.O.G. .. 874
The Biology of the Children of Hopewood House, Bowral, New South Wales: I. Observations on Dental Caries Extending Over Five Years (1947 to 1952), by B. Lilienthal, N. E. Goldsworthy, H. R. Sullivan and D. A. Cameron .. 878
Anterior Dislocation of the Shoulder: Reduction by the "Hanging-Arm" Technique, by Gordon Kerridge .. 882
Development of Isonicotinic Acid-Hydrazide Resistance in Mycobacterium Tuberculosis: Preliminary Publication, by J. S. Incze .. 883
Port Augusta Meningitis, by J. A. R. Miles and D. M. Surrey Dane .. 884

REPORTS OF CASES—
A Complicated Aneurysmal Varix of the Femoral Artery Treated by Arterial Suture, by J. T. Hueston .. 886
Canicola Fever in Australia, by C. N. Sinnamon, V. M. Pask, D. J. W. Smith, H. E. Brown and J. I. Tonge .. 887

BOOKS RECEIVED .. 890

LEADING ARTICLES—
Flight Above the Atmosphere .. 891

CURRENT COMMENT—
Diagnostic Features of Idiopathic Steatorrhœa .. 892
The Hæmatological Effects of Chloramphenicol .. 893

ABSTRACTS FROM MEDICAL LITERATURE—
Physiology .. 894
Biochemistry .. 894

SPECIAL ARTICLES FOR THE CLINICIAN— Page.
LXVII. Anal Bleeding .. 896

BRITISH MEDICAL ASSOCIATION NEWS—
Scientific .. 897

PUBLIC HEALTH—
Summary of the Facilities Available for the Control of Tuberculosis in Australia .. 899

OUT OF THE PAST .. 901

SPECIAL CORRESPONDENCE—
New Zealand Letter .. 901
North American Letter .. 901

POST-GRADUATE WORK—
The Melbourne Permanent Post-Graduate Committee .. 902
The Post-Graduate Committee in Medicine in the University of Sydney .. 902
The Post-Graduate Committee in Medicine in the University of Sydney, in Conjunction with the Royal College of Obstetricians and Gynæcologists .. 903

DISEASES NOTIFIED IN EACH STATE AND TERRITORY OF AUSTRALIA .. 903

OBITUARY—
Leo Doyle .. 903

NAVAL, MILITARY AND AIR FORCE—
Appointments .. 904

DEATHS .. 904

NOMINATIONS AND ELECTIONS .. 904

DIARY FOR THE MONTH .. 904

MEDICAL APPOINTMENTS: IMPORTANT NOTICE .. 904

EDITORIAL NOTICES .. 904

Listerian Oration.[1]

THE FRUITS OF LISTER'S LABOURS: ILLUSTRATED BY AN ACCOUNT OF THE SURGERY OF HYDATID CYSTS.

By HOWARD BOYD GRAHAM,
Melbourne.

"THE CHIEF."

His brow spreads large and placid, and his eye
Is deep and bright, with steady looks that still.
Soft lines of tranquil thought his face fulfil—
His face at once benign and proud and shy.
If envy scout, if ignorance deny
His faultless patience, his unyielding skill,
Innumerable gratitudes reply.
His wise, rare smile is sweet with certainties,
And seem in all his patients to compel
Such love and faith as failure cannot quell;
We hold him for another Heracles,
Battling with custom, prejudice, disease,
As once the son of Zeus with Death and Hell.

—W. E. HENLEY, "In Hospital",
The Old Infirmary, Edinburgh (1873-1875).

TOWARDS the end of the year 1846 a famous thigh amputation was performed in the operation room at University College Hospital in London. Robert Liston, the professor of surgery, operated while the patient, Frederick Churchill, a butler, aged thirty-six years, slept under the influence of ether. It was the first time that a general anæsthetic had been used in Europe to alleviate the terrible experience of undergoing a major operation (Guthrie, 1945). Joseph Lister was present. He must have been enormously impressed. He was only nineteen years of age; but he had been a medical student of University College for two years. His father was a man of science who was admitted to the Royal Society for the excellence of his work in perfecting the achromatic microscope, by means of which exact knowledge concerning biological subjects was being wrested from Nature. Father and son were alike in that they had ability, were studious and were passionately devoted to the extension of the frontiers of knowledge.

After graduation, Joseph Lister did not need to earn his living as a doctor, but was free to follow his bent. At twenty-six he became house surgeon at the Royal Infirmary in Edinburgh under the professorship of the great James Syme. Three years later he married Agnes, the professor's eldest daughter (Godlee, 1921). They made a tour of the continent, visiting the medical schools and meeting the leading surgeons. Lister continued at Edinburgh, working with Syme and lecturing on surgery, until, in 1860, he obtained a professorship for himself at Glasgow. There he enlarged his experience considerably and contributed many professional articles on his research projects. In 1864, his colleague, Thomas Anderson, the professor of chemistry, interested him in the novel discoveries of Louis Pasteur. Lister promptly realized the significance in surgery of Pasteur's ideas on germs. The germs were minute living

[1] Delivered at a meeting of the South Australian Branch of the British Medical Association on April 30, 1953.

organisms responsible for decomposition, and their activities could be arrested by physical means. They could be caught in fine filters and could be destroyed by heat. Intimate contact with certain chemical substances such as carbolic acid had proved effective against them. The Carlisle sewage effluent had been deodorized successfully with phenyle.

Lister settled down to a long series of experimental studies at Glasgow, which culminated in the establishment of the principles of antiseptic surgery. The first pronouncement appeared in *The Lancet* in 1867 (Lister, 1867). It contained observations on the conditions of suppuration with case reports of the successful treatment of compound fractures, abscesses and other suppurative conditions by a new method. Incidentally, four out of the eleven patients whose cases he described were children—boys aged between seven and thirteen years. Within three years, six other articles appeared containing details of the primary dressings, absorbent prepared sutures, use of carbolic acid in watery lotions and by spray (to cleanse the air) and many another innovation to be applied in the practice of surgery.

By 1870, Lister's father and his father-in-law had both died, and Lister was Scotland's leading surgeon and professor of clinical surgery in Edinburgh with the whole world interested in his activities; but many leading surgeons in England and in America were sceptical or at least reluctant to apply his methods. It must have been a great satisfaction to him to accept appointment in 1878 as professor in clinical surgery at King's College, London, where, after a chilly reception, he broke down all resistance through his work as a surgeon in King's College Hospital, and by means of innumerable addresses and demonstrations of the outstanding merit of his antiseptic surgery. By 1883 he had won his great uphill fight, and he received a baronetcy and many other distinguished honours. He was free to go on lecture tours in foreign parts and to train disciples through whom the new principles came to be applied for the benefit of all humanity. A great many new operations were added to surgery, and, aided by advances in the skilled application of general anæsthetics, surgeons were enabled to attack areas of the body which had hitherto been sacrosanct. The transition to modern aseptic surgery was gradual and almost imperceptible. Though adumbrated by Lister, aseptic surgery could not be practised without some important discoveries which were made at a later date. Lister himself decided to dispense with the carbolic spray in 1887, though, long before that time, other surgeons had found that the exclusion of germs from the operation site was not vital to success. However, it was soon proved that surgeons must not actually introduce germs in opening the tissues.

Lister was a kindly, conscientious man who inspired his fellow-workers as only a great man can. He was childless, but took a paternal interest in many a young surgeon. He fired those acolytes with his zeal. Their ideal became to follow as closely as possible in his footsteps. In 1893 he lost his wife and he reached the retiring age at King's College Hospital. He devoted the rest of his active life to public duties of great responsibility. He succeeded Lord Kelvin as President of the Royal Society and occupied the post for five years with dignified distinction. In the year of Queen Victoria's Diamond Jubilee he was elevated to the peerage. That was unique for a man of medicine without any political claims to recognition. Early in the next reign he was admitted to the Privy Council and received the Order of Merit. Universal publicity was given to his attainment of the venerable age of eighty years; and he emerged momentarily from retirement on that occasion. He lived until 1912, when the last respects were paid to him at a large funeral service held in Westminster Abbey. There a memorial medallion consolidates his eminence for ever.

It must be conceded that circumstances had favoured Lister considerably at the critical points in his career; but he made the most of his great opportunity. He lived to be truly famous and to know that he had been able to achieve advances of transcendant importance. They were the outcome of his careful, scientific and methodical attack on the problems that confronted all surgeons at the time. Under the great impetus of Lister's discoveries, surgery as a curative art has gone on from triumph to triumph. The fruits of Lister's labours (Bailey and Bishop, 1946) surround us in lavish abundance. We may take a small sample by way of illustration and examine it in some detail.

To this present day, nothing of a medicinal nature has been found which has a significant effect in the treatment of hydatid infestation (Barnett, 1941); surgical eradication of the parasite and complete restoration of the host are the requisites. An account of the progressive steps taken towards the ultimate goal—removal of the cyst and cure of the patient—should show the influence of Lister. Doctors of all kinds can play their parts in the making of the diagnosis with precision; but only the surgeon can carry out the material treatment. Before the time of Lister, great ingenuity was required to cope with cysts in the liver; either pulmonary cysts killed the patients, or uncertain cure followed after spontaneous rupture into the bronchial system.

Until the end of the nineteenth century at least, the issue is clouded to a certain extent with tangled terminology and confusion of the cystic forms of entozoa encountered in human subjects. For our present purpose—the illustration of the fruits of Lister's labours—it will suffice if we consider first the "tapping" operations for hepatic cysts. Récamier gave up the use of caustics and was associated at an early stage with the procedure followed by many surgeons one hundred years ago. The cyst was punctured with a fine trochar, and some of the fluid was withdrawn through the cannula carried into place on the trochar. Owen Rees (Rees, 1848) introduced the use of trochars increasing in size from that used at the first puncture, until on about the third occasion a gum-elastic sound could be inserted into the orifice. Subsequently the sound could be withdrawn from time to time for the removal of contents under pressure in a manner designed to prevent the cyst from increasing in size, and in the belief that the cyst would thus be killed. It seems certain that pus was obtained regularly at the third puncture; and it was believed that "limpid liquid" signalled the death-knell of the hydatid cyst.

Cruveilhier, the celebrated pathologist of the Faculty of Paris, deprecated the general employment of tapping techniques unless it was proved that adhesions existed and that the tumour was pushing outwards. In 1859, Moissenet provided a summary of the situation (Moissenet, 1859). His conclusions were that puriform hydatid fluid leaking into the peritoneum induced inflammation which was nearly always fatal; that it was desirable to empty a cyst completely whenever puncture was undertaken, because even palliative capillary puncture was liable to have that very undesirable sequel; that puncture with a trochar of any size might induce inflammation of the cyst itself with fatal consequences to the patient; and that another method such as that of Rees might be necessary to complete a cure; though he conceded that single tapping or successive punctures might be curative.

To get an idea of what was happening at that time in Australia about hydatid infestation, reference may be made to a meeting of the Medical Society of Victoria on February 6, 1861. Dr. R. F. Hudson, the resident physician to the Melbourne Hospital, addressed the meeting on the subject. He mentioned many features of interest and blamed the mode of life of the miners and the careless habits of aborigines and others for an alarming increase in frequency of the disorder. He produced 18 cysts collected from 16 patients at the hospital within seven months. We note that "in thirteen instances the diagnosis was made during life" (Hudson, 1861). After the lecture, T. S. Ralph demonstrated "echinococci" under the microscope and carried out chemical tests to show that clear hydatid fluid was saline and non-albuminous. Hudson is credited (Atkinson, 1867) with the introduction of the capillary trochar to his colleagues in Melbourne.

At about that time four cures were claimed by Dr. Southie from Maryborough, a small country centre. Here is a brief report of one of the cases (Dunn, 1861):

CASE I.—The skin over the cyst in the liver was painted with tincture of iodine and was blistered for eleven weeks until fluctuation was perceptible. A trochar was introduced and thirty ounces of clear hydatid fluid were withdrawn. A bandage was passed tightly around the body. An hour later, cold shivering occurred and a nettle rash appeared. A week was allowed to pass and then potassium iodide was prescribed in a mixture to kill the parasite. Within a month, the patient was cured and left the hospital to return to his home.

The contemporary treatment of a large "dome" cyst is outlined in a case history from the Melbourne Hospital in 1862 (Hospital Reports, 1862):

CASE II.—An assistant in the Survey Department had had the sensation of compression in the right epigastrium and hypochondrium for six years. A large globular tumour projected from under the false ribs; and the chest was dull, with absence of breath sounds, up to the level of the fourth rib. By means of a small trochar and cannula, one hundred and fifty ounces of clear hydatid fluid were removed from below the rib margin. Iodine paint was applied to the site and potassium iodide was used internally. Nineteen days after the tapping he was sent home, but he was re-admitted in two weeks. The pressure in the chest was worse than ever and he had diarrhœa with tympanites. Hot flannels were applied to the abdomen every two hours and were secured by a dry sheet wrapped tightly around the body. Each time a stool was passed, he was given one teaspoonful of syrup of morphia. On the fourth day he was tapped at the rib margin again; and thirty-five ounces of turbid fluid were obtained. He became constipated and tympanitic. Podophyllin was used to overcome the constipation. He was tapped again in a fortnight; a capillary trochar was inserted in the sixth intercostal space. Globules of pus came through; so a large trochar and cannula was used; and ninety ounces of purulent material were drawn off. He became ambulant in four weeks and left the hospital cured soon afterwards.

From the recorded "Table of Operations at the Melbourne Hospital" for 1863 (Melbourne Hospital, 1864) we find that Beanie, Barker, Thomas and Motherwell all tapped hydatid cysts, and without anæsthesia. Six "tappings" are included in 189 operations performed in that year; chloroform was used for 132 of the operations without a death ascribable to the anæsthetic. In addition, on June 6, Barker extirpated a hydatid cyst under chloroform from "immediately beneath the integuments" over Scarpa's triangle of the right thigh of a woman.

Incidentally, Edward Barker was the first lecturer in surgery in the Medical School of the University of Melbourne, and in the Inaugural Lecture, published in 1864 (Barker, 1864) he gave an account of pre-Listerian surgery. He laid emphasis on the great expansion of the surgeon's art which had been effected through the widespread use of chloroform. As Ernest Hemingway's tough old fisherman remarked: "Every day is a new day." (Hemingway, 1952.)

Dunn, of Maryborough, reported (Dunn, 1863) a failure in 1863. It provides an interesting contrast to Case II.

CASE III.—The patient had had pain in the right side for three years, with increasing dyspnœa and feeling of weight and compression. He had been treated elsewhere for a liver complaint without obtaining relief. After seventeen days in hospital, fluctuation was found by careful examination. A very fine trochar was inserted laterally into the right side of the chest to a depth of three inches; and seventy-two ounces of hydatid fluid were withdrawn. A week afterwards, the patient walked to his home twelve miles away. He returned in three weeks worse than ever. Through a larger and longer cannula, sixty ounces of pus and some pieces of cyst wall were obtained. He died in three days. The right lung, pleura, diaphragm and liver were matted together over a huge cyst.

Early in 1864, F. Dowling reported (Dowling, 1864) a case on behalf of Brownless from the Melbourne Hospital. The cyst was a pulmonary one, and Dowling included a thoughtful commentary.

CASE IV.—For nine months in hospital the patient was considered to be phthisical, but, when he coughed up material which was identified as fragments of cyst wall, the presence of hydatid disease was established. He died, six months later, quite free from tuberculous lesions; but there was a cavity "the size of a large lemon" in the centre of the lower lobe of the left lung. The cavity contained blood, hydatid fluid and debris. The walls were firm; but no distinct lining remained. No hydatid cysts were found elsewhere in the body.

We may infer from Dowling's commentary that cysts without scolices or daughter cysts in them were then referred to as acephalocysts—"a name at first given by Laennec to all hydatid growths". He went on to state that it was unusual to find a cyst in the lung only; that the outer cyst was prone to be inflamed; that the destruction of the dwelling-place was the first step in Nature's cure; and that hæmoptysis, though a sign of ill omen in phthisis, could be regarded as favourable evidence of progress of natural cure.

Paul MacGillivray was surgeon-superintendent of the Bendigo Hospital for many years. Between 1865 and 1872 he reported his experiences gained in the treatment of 74 patients with hydatid disease, of whom 18 died. Fifty-eight operations were performed. Ten patients had pulmonary cysts, most of which ruptured into the respiratory passages as they are apt to do today. In those cases the features were hæmoptysis and the coughing up of fragments of cyst wall and cyst contents.

In illustration of surgical treatment just before the Listerian era, a specimen of MacGillivray's case histories is worthy of quotation (MacGillivray, 1865, 1867, 1872).

CASE V.—A governess, twenty-seven years of age, spent a year in the Bendigo Hospital with what was regarded as a right-sided tuberculous pleural effusion. On the assumption that the effusion had become purulent, the decision was made to perform paracentesis. By measurement, the right side of the chest was two inches bigger than the left. Forty ounces of pus were obtained through a large cannula introduced below the inferior angle of the right scapula. Three days afterwards, the opening was probed and a number of small hydatid cysts escaped. The opening closed, but it was reopened in four weeks; a catheter was inserted through the cannula and was left in position. The cavity was irrigated regularly with warm water, and cysts continued to come away. The single catheter was replaced later with a large double one with a rubber syringe attached. Instead of plain water, weak zinc sulphate solution was used as the irrigation fluid. Disintegrated lung tissue and yellow elastic fibres were recognized microscopically in the detritus. The lung gradually re-expanded and a cure was claimed; but a small sinus had formed and it would not heal.

Though others published case reports, including Rudall (1859), Tracy (1862), Gillbee (1862), Cooper (1863), and Atkinson (1867), Hudson and MacGillivray became the leading authorities in Victoria, in the pre-Listerian period, on the management and treatment of hydatid cysts. For pulmonary cysts, spontaneous cure by expectoration was desired and expected. If the cyst became embarrassingly large, it was to be tapped with the small trochar, and complete emptying was to be attempted. If less fluid was obtained than was to be expected, it was presumed that a great many daughter cysts were present. When the cyst refilled, tapping was to be repeated and followed by the insertion of a catheter or drainage tube to prevent closure. When the presence of pus or debris was recognized, the opening was to be enlarged cautiously to avoid going beyond the limits of adhesions. Irrigation through the indwelling catheter would be likely to assist in the expulsion of the contents of the cyst; but in the case of pulmonary cysts, irrigation might precipitate communication with the bronchial tree, and that could be catastrophic.

Then Listerism came to Melbourne. W. H. Jenkins addressed the meeting of the Medical Society of Victoria held on February 7, 1872. Dr. Newman, of Stamford, had demonstrated the new antiseptic treatment at the Stamford and Rutland Infirmary, where Mr. Jenkins had verified its wonderful success. Jenkins had also heard Lister deliver the address in surgery (Lister, 1871) at the annual meeting of the British Medical Association held at Plymouth in August, 1871. Almost immediately afterwards, Jenkins had come to Victoria and accepted appointment at the Hamilton Hospital. Just six months after Lister had launched the new system of surgery in England, Jenkins explained the details to the leaders of the medical profession in Victoria (Jenkins, 1872). Within a few days Gillbee introduced the

method at the Melbourne Hospital. Jenkins said that Richardson's vaporizer, which was well known, was more efficient than the vulcanite spray used by Lister's two assistants to keep the skin, the hands of the surgeon and every particle of the large dressings impregnated with one part of pure carbolic acid to 40 of filtered water. He mentioned that prepared oil-silk with a covering of dextrine to absorb the acid was placed precisely over the incision after the operation; and that mackintosh "hat lining" was used in the outer layer of gauze in the absorbent dressing to intercept the discharges and to spread them evenly through the eight layers of gauze. He described how ordinary book muslin was prepared for the dressing by being soaked in a melted solution of one part of carbolic acid, one part of resin and six parts of pure paraffin; it was wound accurately around the parts and helped considerably by its stickiness to keep the overlying bandages in place to exclude germs and air from the wound.

At about that time, S. D. Bird laid down "specific rules for the physical diagnosis of the unbroken hydatid cyst within the chest wall and its immediate and successful surgical treatment". His monograph (Bird, 1877) is disappointing from our modern point of view, because the surgery described is crude and conservative. The improvement in surgical technique appears to be that, after the usual procedure had been carried out, the wound was enlarged from side to side sufficiently to allow a sponge tent to be inserted. On the removal of the tent a few days afterwards, the cyst was expected to be found bulging into the wound. It was to be twisted out steadily and slowly in stages by the house surgeon. "Unbidden guests are often welcomest when they are gone." Bird protested against the use of aspirators and complicated valved apparatus for removal of fluid from the chest. He disliked "the violent and unnatural suction". He preferred to slip a foot or two of rubber tubing over the head of the cannula with the free end under water in a vessel alongside. By that method, he held that entrance of air was prevented and that the lung gradually re-expanded.

Simon's operation, known as "double puncture and incision", was introduced in France in 1866. The principle was that the cyst, having been destroyed by suppuration, should be removed through an incision made from the point of insertion of one cannula to that of the other. It would be found that the incision would pass only through adhesions, and that the hydatid cyst would be extracted safely through the opening. This operation was ruined by Listerism. When the cannulæ were inserted with antiseptic precautions, it was found that adhesions did not form in two weeks and that the cyst contents did not necessarily suppurate. Simon's operation was abandoned in favour of that of Lindeman, of Hanover, which was first performed in 1871. Lindeman "incised the parietes, exposed the sac, opened it, and stitched it to the abdominal wall, all under antiseptic precautions" (Thomas, 1889). Saenger modified this procedure by securing the cyst to the lips of the external wound before making the incision into it (Saenger, 1877). Operations of this type became widely known as "marsupialization" of hydatid cysts.

John Davies Thomas, of Adelaide, was busily at work seventy years ago making a very thorough study of hydatid infestation. He produced many publications which were collected in book form in 1884 and again later (Thomas, 1884, 1889, 1894). Those books remained as classics in English until Harold Dew, of Melbourne (now of Sydney) published his masterpiece in 1928 (Dew, 1928). Up to 1884, Davies Thomas had collected 208 case histories about pulmonary cysts. The death rate was 60% despite the fact that when spontaneous rupture occurred it was under 40%. He was justified in describing the disease as a "formidable" one. At that time he adopted the principle that a hydatid cyst in the lung should be attacked surgically without delay when there was "proof positive of the nature of the disease and its precise locality", provided that the cyst was near the surface and that compressed lung was not present between the cyst and the chest wall. He described the operation he used. As a preliminary step he made a subperiosteal partial resection of an inch or two of one or two ribs over the site of the cyst and secured hæmostasis. He then pierced the periosteum with a small trochar to ascertain the depth at which he could first meet fluid. If he did not find fluid, he did not go on with the operation, and as he was an expert in antiseptic surgery, he believed that he had not done the patient any harm. If the presence of a cyst at a known depth was proved, he passed a strong well-curved needle to insert guy sutures of stout aseptic silk through the pleura and the coverings of the cyst. He then removed some fluid from the cyst to reduce the tension and incised the sac freely to admit two fingers. With his fingers and a suitable forceps he emptied the sac and sponged it out thoroughly. The opening in the sac was then stitched securely to the external wound with carbolized silk, kangaroo tendon or silver wire. He placed a large drainage tube in position and applied "the usual antiseptic dressings". Thomas's own comment was that "the results are usually excellent and immediate, for cough and expectoration cease, pyrexia disappears and the patient rapidly gains flesh and strength".

James Graham, medical superintendent of Prince Alfred Hospital, Sydney, obtained the degree of doctor of medicine at Edinburgh with a magnificent thesis on the clinical aspects of hydatid disease. He extended the thesis and produced a splendid book which was published in 1891 (Graham, 1891). In convincing terms he denounced all the tapping and aspirating operations and gave a clear warning about the danger of puncturing a hydatid cyst except in the course of a planned operation. Exploratory puncture for diagnostic purposes, even with a hypodermic needle, had, in his own experience, repeatedly caused grave unexplained shock and had proved fatal. Graham advocated the use of operations of the Lindemann type which had "decidedly given the best results".

Formolage was introduced by the French surgeons (Dew, 1928). It is based on the fact that a weak formalin solution will kill scolices and fix brood capsules in a few minutes. Some surgeons replace portion of the cyst contents with formalin solution and wait a few minutes before going on with the operation. Others swab the cyst with formalin after removal of the contents. It was usual for many years to clear the cyst and its contents from the sac and then to perform formolage on the sac in case any reproductive elements were left behind.

Delbet, of France, devised what was known as the "closure" operation in 1896 (Delbet, 1896). It is often linked with his name or with that of Posadas of South America. After removal of the cyst and its contents and thorough cleansing and formolage, the sac space was obliterated, usually around a drainage tube which could be shortened from time to time and be removed when it ceased to act as an outlet for fluid. Bond (1891) dropped the sac back into the wound when dealing with simple uncomplicated abdominal cysts.

Hamilton Russell (1895) was a participant in these developments and made several contributions of an original nature. He was trained at King's College Hospital and was in close contact with Lister there from 1882 until Russell came to Melbourne in 1890 (Stawell, 1933). He practised the principles of Listerism and inculcated them in many who served with him in Melbourne at the Children's Hospital and at the Alfred Hospital. In Russell's collected papers and addresses (Russell, 1923), he has left us an account of the circumstances under which he introduced the meticulous closure of certain hydatid sacs after they had been filled with normal saline solution. He held that thereby any noxious substances present would be diluted, air would be excluded and hydrostatic pressure would be exerted to minimize the entrance of blood or bile. An illustrative case is cited by him to show that the filling would disclose the presence of a rent in the sac which might have disastrous consequences if it was not known to be there.

By the turn of the century an important new clinical aid became available. Röntgen had discovered X rays (Bailey and Bishop, 1946), and radiology developed rapidly to allow of precision in the diagnosis and localization of

hydatid cysts and in the aftermath of surgical interference or of accidents to the cysts. During the past fifty years considerable progress has been made in the assistance that can be rendered by scientific laboratory workers. Great activity was displayed in that regard in Melbourne by the members of the staff of the Walter and Eliza Hall Institute for Medical and Pathological Research. In 1922, N. Hamilton Fairley reported (Fairley, 1922*a*, 1922*b*) that he had established that the presence of hydatid antigen could be demonstrated quantitatively by fixation of complement. Kellaway and his colleagues studied the antigenic and anaphylactic characteristics of hydatid elements (Bryce, Kellaway and Williams, 1924; Kellaway, Fairley and Williams, 1928; Kellaway, 1928; Kellaway, 1929). Interest in the complement fixation test has been intense at the Hall Institute ever since, and careful assessments of its clinical value have been supplied (Fairley and Williams, 1930; Kellaway and Fairley, 1932; Fairley and Williams, 1935). In 1911, Casoni, of Italy, elaborated an intradermal test for the presence of hydatid antigen in the skin. That test has also been evaluated very carefully at the Hall Institute (Dew, Kellaway and Williams, 1925; Fairley, Fairley and Williams, 1929; Kellaway and Fairley, 1932; Fairley and Wright-Smith, 1935). In 1922, Dew reported his observations on the mode of development of brood capsules and scolices (Dew, 1922), and he continued to study the hydatid subject in every aspect (Dew, 1928).

During the present century, our knowledge of the peculiarities of the encysted form of *Tænia echinococcus* in the human body has been extended by many people in many countries. Félix Dévé, the celebrated professor of clinical medicine at Rouen, must receive special mention; he has published several hundreds of papers on the subject (Dévé, 1932). Much enlightenment has also come from South America, Iceland, and latterly from the United States of America.

In 1949, N. R. Barrett, of St. Thomas's Hospital, London, reported (Barrett, 1949) the technical details of his operative treatment of univesicular pulmonary cysts. It is the nearest approach to our defined goal—the removal of the cyst and restoration of the host. A brief paraphrased description of his technique is therefore appropriate here. Through a wide opening into the pleural cavity, the lobe containing the intact cyst is freed, and a waterproof bag is drawn over it. The bag is tightened towards the hilum and left open at the bottom, which is kept clear of the operative field. The sac of the cyst is induced to crack by judicious dissection. The anæsthetist has the patient under general intratracheal anæsthesia with an airtight circuit. When the surgeon is ready, the anæsthetist applies positive pressure to the respiratory passages. The cyst is slowly but surely herniated into the bag, intact, alongside the lobe that contained it. The cyst can then be rolled by gravity into a receiving dish without touching the wound or anybody's hands.

At the end of last year, Barrett was associated with Dillwyn Thomas in the publication of a comprehensive article on hydatid disease of the lungs (Barrett and Thomas, 1952). We can get from it an excellent picture of the clinical situations they have encountered and of the way in which they have dealt with them. The description is based on experience of 71 cases since 1938. They seem to favour early operation designed to remove pulmonary cysts completely, without aspiration or incision of the cyst. If the cyst is not small, they carry out a segmental plane dissection of it and its sac; and they can cope satisfactorily with the bleeding. They are prepared to go on to perform lobectomy or even pneumonectomy if necessary in complicated cases. They ensure the eradication of the cyst and of any surrounding area of pneumonitis. They close fistulous bronchial inclusions, but ligate the main segmental bronchus securely if that action is indicated. Their objective is to prevent the likelihood of lung abscess or of post-operative suppuration in the cavity. The sac is obliterated with purse-string sutures from the bottom upwards.

As a mere physician it is not my intention to discuss the relative merits of the techniques used by contemporary surgeons. Hamilton Russell called Lord Lister the maker of modern surgery (Russell, 1923*a*). In Melbourne, from whence I come, thousands of major operations are performed each year and the mortality rate is very low. Pulmonary hydatid cysts occur but seldom; but thoracic surgeons treat them competently as part of the normal programme. Surgeons everywhere, the world over, are constantly at work giving relief to those in need, be they new-born babes or those on the brink of the grave. The fruits of Lister's labours surround us on every hand.

The grandeur of the superstructure built on the foundations laid by Lister and his collaborators has been accentuated by specialization. After a broad basic education in medical matters, many graduates, at very great economic sacrifice, have made an intensive study of some department of surgery, of laboratory work in a pathological institute, of radiodiagnosis, of the administration of anæsthetics, or of some particular aspect of clinical or experimental medicine. By combining their resources and pooling their special contributions, they unravel the complex symptomatology of diseases such as hydatid disease, and they solve technical problems such as those involved in the removal of the parasite and the restitution of the damage suffered by the host.

With increasing frequency, patients with pulmonary hydatid cysts are gravitating to the large teaching hospitals and to the thoracic clinics; those with intracranial cysts are likewise reaching the brain surgeons. The general surgeons get their share, but know their limitations in the more highly specialized fields. Unpremeditated rupture of a hydatid cyst may still occur while the patient is on the operating table; but such accidents are to some extent dependent on the manual dexterity and surgical judgement of the operator. That and many other hazards must be overcome; a surgeon must be prepared to handle any emergency which arises in the course of an operation.

In recent years, the availability of a wide range of antibiotics has helped the surgeon to forestall infection and has made it possible for him to complete his operations by closure. He can thus avoid drainage with the associated delay in healing and the scarring of the drainage track.

No medical remedy now or in the past has ever had any real effect on a hydatid cyst, and the treatment for human infestation must perforce be surgical. I have used this small thread to trace the profound effect of Lister's work.

In June, 1947, our good friend Sir Gordon Gordon-Taylor delivered a charming and generous tribute to those from Australia and New Zealand who have advanced surgical science (Gordon-Taylor, 1947). The record is one of which we may with justice be proud; but it must not make us complacent.

It is becoming increasingly difficult to combine busy private practice with experimental work, special studies and the teaching of undergraduate and post-graduate students. Those with the necessary experience and ability must do this work. Very few suitable and adequately salaried academic posts are available here in medical schools and in teaching hospitals. Many more must be established. Then we will produce our Listons, our Symes and, perhaps occasionally, our Lister. They will reach heights still beyond the horizon.

References.

ATKINSON, H. L. (1867), "Remarks on Hydatid Tumours", *Aust. M. J.*, 12 : 289.

BAILEY, H., and BISHOP, W. J. (1946), "Notable Names in Medicine and Surgery", Second Edition, Lewis, London : 156, 129.

BARKER, E. (1864), "Inaugural Lecture in Surgery", *Aust. M. J.*, 9 : 152, 180.

BARNETT, L. (1941), "Peritoneal Hydatid Cysts", *Aust. and New Zealand J. Surg.*, 10 : 230.

BARRETT, N. R. (1949), "Removal of Simple Univesicular Pulmonary Hydatid Cysts", *Lancet*, 257 : 234.

BARRETT, N. R., and THOMAS, D. (1952), "Pulmonary Hydatid Disease", *Brit. J. Surg.*, 40 : 222.

BIRD, S. D. (1877), "On Hydatids of the Lung", Second Edition, George Robertson, Melbourne, Sydney, Adelaide.

BOND, C. J. (1891), "On the Treatment of Hydatid Disease by Incision and Evacuation of the Cyst without Drainage", *Brit. M. J.*, 1 : 795.

BRYCE, L. M., KELLAWAY, C. H., and WILLIAMS, F. E. (1924), "A Study of Hydatid Antigen", *Aust. J. Exp. Biol. & M. Sc.*, 1: 77.

COOPER, S. J. (1863), "Hydatid Cysts of Both Kidneys", *Aust. M. J.*, 8: 122.

DELBET, P. (1896), *Bull. Acad. de méd., Paris* (February 18); quoted by Dew (1928), *loco citato*, page 243.

DÉVÉ, F. (1932), *"Titres et travaux scientifiques du Profr. F. Dévé—I. Travaux concernant l'échinococcose"*, 1: 240. Imprimerie Lecerf, Rouen.

DEW, H. R. (1922), "Observations on the Mode of Development of Brood Capsules and Scolices in the Encysted Stage of Tænia Echinococcus", M. J. AUSTRALIA, 2: 381.

DEW, H. R. (1928), "Hydatid Disease, Its Pathology, Diagnosis and Treatment", Australasian Medical Publishing Company, Sydney.

DEW, H. R., KELLAWAY, C. H., and WILLIAMS, F. E. (1925), "The Intradermal Reaction in Hydatid Disease and Its Clinical Value", M. J. AUSTRALIA, 1: 471.

DOWLING, F. (1864), "On a Case of Hydatid Disease in the Lung", *Aust. M. J.*, 9: 105.

DUNN, R. H. (1861), "Four Cases of Hydatids", *Aust. M. J.*, 6: 291.

DUNN, R. H. (1863), "Hydatids of the Lung Extending into the Liver", *Aust. M. J.*, 8: 23.

FAIRLEY, K. D., FAIRLEY, N. H., and WILLIAMS, F. E. (1929), "Some Fallacies in the Intradermal Test for Hydatid Disease", M. J. AUSTRALIA, 2: 320.

FAIRLEY, K. D., and WILLIAMS, F. E. (1930), "The Complement Fixation Test in Hydatid Disease: An Analysis of Its Results", *J. Coll. Surg. Australasia*, 2: 317.

FAIRLEY, K. D., and WILLIAMS, F. E. (1935), "The Complement Fixation Test in Hydatid Disease", *Roy. Melbourne Hosp. Clin. Rep.*, 6 (ii): 73.

FAIRLEY, K. D., and WRIGHT-SMITH, R. J. (1935), "The Intradermal Test in Hydatid Disease", *Roy. Melbourne Hosp. Clin. Rep.*, 6 (ii): 82.

FAIRLEY, N. H. (1922*a*), "Researches on the Complement Fixation Reaction in Hydatid Disease", *Quart. J. Med.*, 25: 244.

FAIRLEY, N. H. (1922*b*), "The Complement Fixation Test for Hydatid Disease and Its Clinical Value", M. J. AUSTRALIA, 1: 341.

GILLBEE, W. (1862), "Hydatid Tumour of the Cheek", *Aust. M. J.*, 7: 273.

GODLEE, R. J. (1921), "Six Papers by Lord Lister, with a Short Biography", Bale, Sons and Danielsson Limited, London, page 4 and plate II.

GORDON-TAYLOR, G. (1947), "The George Adlington Syme Oration—The Debt of Surgical Science to Australasia", *Aust. & New Zealand J. Surg.*, 17 (ii): 75.

GRAHAM, J. (1891), "Hydatid Disease, in Its Clinical Aspects", Pentland, Edinburgh and London: 159, 161.

GUTHRIE, D. (1945), "A History of Medicine", Nelson, page 304 and plate LXI.

HEMINGWAY, E. (1952), "The Old Man and the Sea", Cape: 29.

HOSPITAL REPORTS, MELBOURNE HOSPITAL (1862), "Case of Hydatids of the Liver", *Aust. M. J.*, 7: 42.

HUDSON, R. F. (1861), "On Hydatids", *Aust. M. J.*, 6: 75.

JENKINS, W. H. (1872), "On Some Recent Improvements in Surgery", *Aust. M. J.*, 17: 40.

KELLAWAY, C. H. (1928), "Hydatid Fluid as an Anaphylactic Antigen", *J. Path. & Bact.*, 31: 141.

KELLAWAY, C. H. (1929), "Anaphylactic Studies with Extracts of Hydatid Scolices", *Brit. J. Exper. Path.*, 10: 115.

KELLAWAY, C. H., and FAIRLEY, K. D. (1932), "The Clinical Significance of Laboratory Tests in the Diagnosis of Hydatid Disease", M. J. AUSTRALIA, 1: 340.

KELLAWAY, C. H., FAIRLEY, N. H., and WILLIAMS, F .E. (1928), "The Filterability of Hydatid Antigens", *Aust. J. Exper. Biol. & M. Sc.*, 5: 189.

LISTER, J. (1867), "On a New Method of Treating Compound Fracture, Abscess *et cetera*, with Observations on the Conditions of Suppuration", *Lancet*, 1: 326, 357, 387, 507; 2: 95.

LISTER, J. (1871), "Address in Surgery", *Brit. M. J.*, 2: 225.

MACGILLIVRAY, P. H. (1865), "On a Case of Hydatids in the Orbit, with an Abstract of Twenty Cases of Hydatid Disease Treated in the Bendigo Hospital", *Aust. M. J.*, 10: 243.

MACGILLIVRAY, P H. (1867), "Hydatid Disease: A Second Series of Cases", *Aust. M. J.*, 12: 65.

MACGILLIVRAY, P. H. (1872), "A Third Series of Cases of Hydatid Disease", *Aust. M. J.*, 17: 213.

MELBOURNE HOSPITAL (1864), "Melbourne Hospital, Table of Operations at, for 1863", *Aust. M. J.*, 9: 44.

MOISSENET (1859), "Puncture of Hydatid Cysts of the Liver with the Capillary Trochar", *Medico-Chirurgical Review*, July, quoted in *Aust. M. J.*, 4: 311.

REES, G. O. (1848), "Case of Hydatid Disease of the Liver, Cured by Operation", *Guy's Hosp. Rep.*, Volume 6, Part 1, Second Series, page 17.

RUDALL, J. T. (1859), "Case of Cysticercus (Hydatid) in the Brain, with Remarks", *Aust. M. J.*, 4: 161.

RUSSELL, R. H. (1895), "On the Future of the Operative Treatment of Hydatid Disease", *Intercolonial Quart. J. Med. & Surg.*, 1: 317.

RUSSELL, R. H. (1923), "Papers and Addresses in Surgery (Selected and Revised)", Grant, Melbourne: 1, 434.

SAENGER (1877), *"Zur operativen Behandlung der Abscesse und Hydatiden der Leber", Berliner klin. Wchnschr.*; quoted by Thomas (1889), *loco citato*, page 71.

STAWELL, R. (1933), "Obituary—Robert Hamilton Russell", M. J. AUSTRALIA, 1: 752.

THOMAS, J. D. (1884), "Hydatid Disease, with Special Reference to Its Prevalence in Australia", E. Spiller, Government Printer, Adelaide.

THOMAS, J. D. (1889), "The Operative Treatment of Hydatid Cysts of the Liver and Lungs", Stillwell, Melbourne.

THOMAS, J. D. (1894), "Hydatid Disease (Volume II), A Collection of Papers on Hydatid Disease", edited and arranged by A. A. Lendon. Bruck, Sydney; Bailliere, London.

TRACY, R. T. (1862), "Two Cases of Hydatid of the Uterus", *Aust. M. J.*, 7: 58.

EARLY DIAGNOSIS OF CERVICAL CARCINOMA WITH SPECIAL REFERENCE TO GENERAL PRACTICE.[1,2]

By R. FRANCIS MATTERS, M.S., M.D., F.R.C.S. (Edinburgh), F.R.A.C.S., F.R.C.O.G.,

Honorary Gynæcologist, Royal Adelaide Hospital, Honorary Obstetrician, Queen Victoria Hospital, Adelaide.

THE subject of pelvic carcinoma may be too much for this address; therefore it is proposed to limit it to carcinoma of the cervix with perhaps minor reference to carcinoma of the vulva.

Primarily one would review the methods of investigation and diagnosis of carcinoma of the cervix. The reason

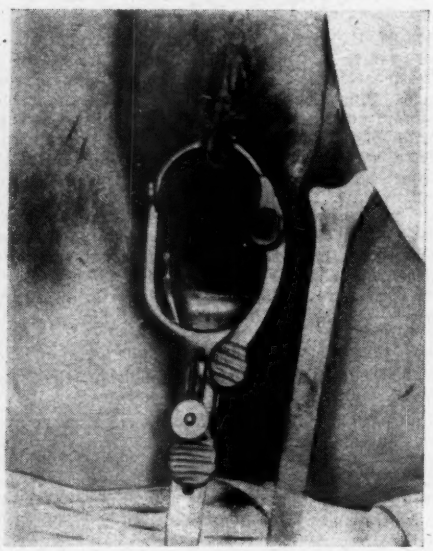

FIGURE I.

Self-retaining speculum; alongside is the spatula for surface biopsy.

for stressing the importance of early diagnosis of cancer is that by this means better results will be obtained. The treatment of cancer has not made any spectacular advance in the past ten years. Admittedly there are signs of advancement in the use of isotopes and the use of hormones; but early diagnosis is the means by which the great improvement in results will be obtained.

[1] Read at a meeting of the South Australian Branch of the British Medical Association on February 26, 1953.

[2] Figures V to IX in this paper are taken by permission from "Anatomic Plates", by F. H. Netter, published in "Ciba Clinical Symposia" (1952), Volume 4, Number 1. The others are actual photographs.

The results of cancer treatment in Switzerland and Norway have improved tremendously, and most of these improved results are because of early diagnosis.

The importance of this is shown in Odell and Burt's statement that "over 2100 women in the United States die annually from carcinoma of the genitalia".

The mortality in this country also must be very high; but it is not only the mortality but the horrible morbidity of patients who present themselves in the hopeless third and fourth stages of cervical cancer which is such a terrible disaster for the relatives and a macabre legacy for the State. These women become a national deficit on the domestic balance sheet as well as on the Government expenditure; further they increase the demands on public hospital accommodation. Here I can speak of my own department at the Royal Adelaide Hospital, where many

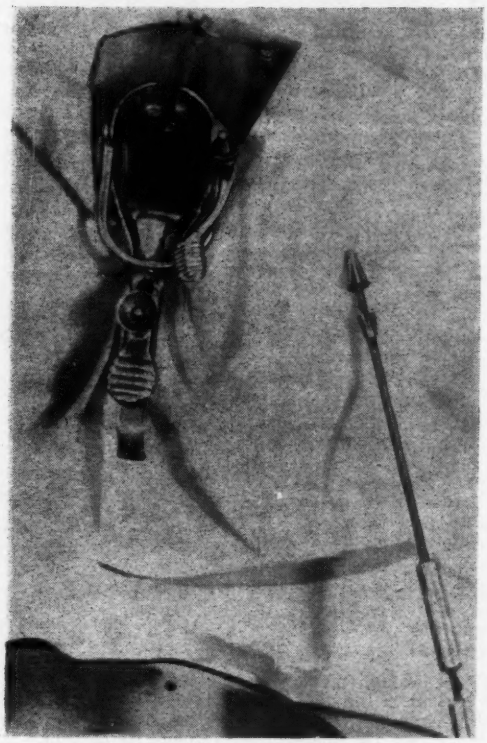

FIGURE II.

Rod with two cones, whose edges are sharpened. With the fixed cone fitted in the cervical canal, the movable cone is rotated so as to remove the muco-cutaneous epithelium.

gynæcological patients, who could be treated surgically and returned to active life and usefulness, are on a waiting list because an average of about a third of the ordinary surgical beds are occupied by cancer patients of whom only about 20% will be returned to useful life.

The difference between the possibly curable patients and the frankly incurable patients is enormous. With the former a plan may be drawn up for treatment and an optimistic prognosis given. With the latter only a bleak outlook can be held. The patient may be the mother of a young family which is very considerably dependent upon her.

There is a tantalizing difference between (*a*) the curable stages of I and II and the probability of the mother's taking her rightful position in the home again, and (*b*) the incurable stages of III and IV, and the knowledge that this patient will suffer in frightfully smelly conditions, and be not only of no use to her family, but actually a nuisance to them both financially and physically. They, the families, do not care to visit the malodorous patient, and she becomes an unwanted burden on the family and the State.

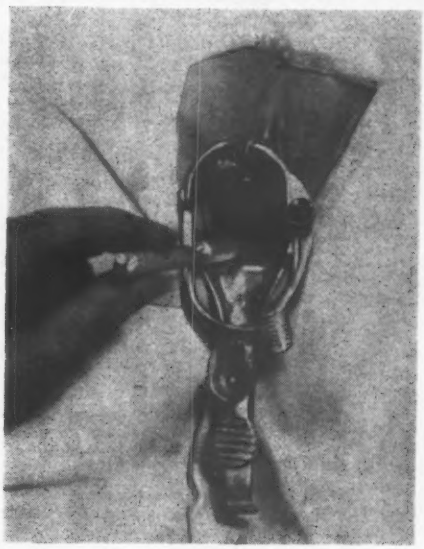

FIGURE III.

Rod with distal cone being inserted into the cervical canal.

This is a rather unusual introduction; but it is given with the express idea of pressing home the conclusion which was forced upon me in every country in Europe as well as in the British Isles and Australia.

FIGURE IV.

Punch for taking cervical punch biopsies.

Cancer of the cervix must be diagnosed while it is in the curable stage, and most of the important early diagnoses depend on the practitioners who must examine the patients and make careful inspections with a good light and speculum.

Practitioners might be given more post-graduate work here as in Norway, which is a vast area and has a scattered population, much more scattered than in Australia. In Norway the practitioners are paid by the government to take a post-graduate course in pelvic cancer.

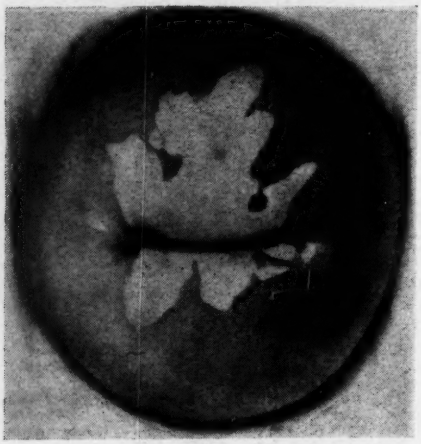

FIGURE V.
Schiller's test, demonstrating area of cells which have no glycogen.

Norway is comparatively poor, especially since the German occupation; but because of early diagnosis the cancer results are amazingly better than ours in South Australia. Practitioners come many hundreds of miles to Oslo to learn to examine a female pelvis carefully both *per*

FIGURE VI.
Epithelial cells with enormous irregular nuclei. The smear is taken from a surface biopsy, and the appearances are regarded as carcinomatous.

vaginam and *per rectum*. They learn to inspect the cervix using a good light and a self-retaining speculum. The practitioner is taught to obtain some guidance from Schiller's test and to make punch and surgical biopsies. If our doctors would make these tests and examinations, it is certain that our cancer morbidity and mortality would be lowered.

In South Australia many patients are examined in a private house, in bed, with a poor light and no speculum, and nothing further is done. This has unfortunately been the case with many patients who were examined at the Royal Adelaide Hospital or in private practice; by the time that they were examined completely a foul discharge and hæmorrhage were present and the condition was beyond cure.

If the history and pelvic examination are unsatisfactory, the patient should be examined at the doctor's rooms with adequate facilities.

The methods of diagnosis of cervical carcinoma are as follows.

1. A careful history is taken and any reference to irregular or contact bleeding or discharge is noted. The so-called menopausal bleeding is an unfortunate fraud; it does not exist. Why medical people talk of menopausal bleeding is beyond comprehension. Menopausal bleeding means that a pathological state exists.

FIGURE VII.
Extensive erosion and Nabothian ovules. Only biopsy can give the final answer "benign" or "malignant" in these cases.

2. A thorough pelvic examination should be made with the patient in the dorsal position and the thighs flexed. A rectal examination should be made also to ascertain whether any parametrial involvement is present.

3. One of the most important examinations is that which is made with a duck-bill self-retaining speculum, with the aid of a good light (Figures I to IV). If there are suspected areas, they may be probed by a uterine sound to test the friability of the cervix. In Switzerland, Germany and Holland the colposcope is used, because this magnifies the area and illuminates the magnified cervix and vaginal vault. This is specialist equipment.

4. The discharge is aspirated from the posterior vaginal fornix, smeared on a slide and stained by the method of Papanicolaou. This is a specialist measure also.

5. A surface biopsy of the cervical epithelium is made by introducing a shaped spatula either of metal or of wood, and rotating it in the external cervical os and so scraping the muco-cutaneous epithelium. This is another specialist measure, and requires a mixture of alcohol and ether in which to place the slides. Positive results indicate preinvasive cancer or carcinoma *in situ*; this is referred to as Stage 0.

6. If a rod with two conical sharpened edges attached is available, these can be made to take out the muco-cutaneous junction by the rotation of one cone edge upon another.

Any practitioner can use this instrument, and it is merely a matter of having one on hand as its use is very simple.

7. Schiller's test is carried out with Lugol's iodine and the pallor of some involved areas is noted. This test can be made by any of you, and can be a useful guide, but will not give a conclusive diagnosis. Schiller showed the results of many such tests, and all the patients who gave positive results were suffering from cancer.

8. A punch biopsy should be made of parts of the cervix which appear to be suspect. This merely requires the snipping off of suspected areas and is quite easy.

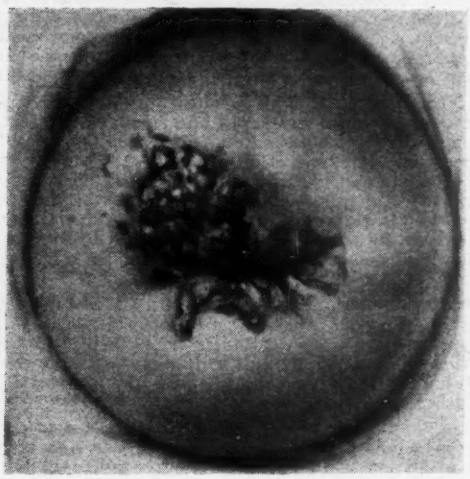

FIGURE VIII.
Early carcinoma, clinically not much different from the appearances in Figure VII.

9. A surgical biopsy is made of any part which may appear abnormal. A wedge is dissected off for pathological examination. The preparation of a biopsy requires the admission of the patient to hospital.[1]

It will be apparent that clinical diagnosis is insufficient; but it is equally apparent that a good view of the cervix will indicate whether further investigation is necessary, especially if there has been any irregular bleeding.

The early diagnosis in most cases depends upon the general practitioner. It is the general practitioner who, if a careful examination is made with a good light, can make a punch biopsy and carry out Schiller's test, or refer the patient to a specialist.

Diagnostic centres such as are found in other parts of the world and have been introduced to Tasmania by Sir Edward Hallstrom would be of great value in Adelaide. At a diagnostic centre appointments could be arranged and inspection of cervices and biopsies of one sort or another could be made. These investigations would not involve the domestic upset of the patient's going into hospital for a few days, and so people would not be put off these investigations on that account. At the centre the biopsies *et cetera* could be taken, but the pathological investigations could be decided on by a competent pathologist.

The public will gradually realize that early diagnosis is of paramount importance, and, as in Switzerland, which has the best cancer results of all recorded countries, people would become anxious to learn the truth. In Zurich, women go along almost as a matter of course, and the fear of the results of investigations, which is said to keep so many women away, is mitigated by the large cure rate, and patients are thus encouraged to seek early investigation.

[1] At this stage Dr. Matters showed a number of slides to illustrate the cytological appearance in some surface biopsies and Papanicolaou's smears. (See Figures V to IX.)

The conclusion which one draws from experience in many countries is that every woman who seeks medical attention for her genitalia should be examined carefully by digital examination and by means of a speculum with a good light.

Within the past four months in the Royal Adelaide Hospital three patients with carcinoma have been admitted to my beds, and the cancer had been overlooked initially.

The first woman had undergone subtotal hysterectomy in another State, and within a month a huge proliferative squamous cell carcinoma of the cervix was found and the patient was referred to the Royal Adelaide Hospital. Radium treatment was begun at once, and a few weeks later a clearance of the pelvis was performed by removal of all the glands, dissection out of the ureters (this being more difficult because of the recent operation) and removal of all the cellular tissue and the cervical stump.

Another patient had had an adenocarcinoma of the vaginal vault, and no follow-up examination had been made after a panhysterectomy. Unfortunately the operation was performed out of Adelaide, and four years later the patient was found to have a vaginal mass of friable tissue.

A third patient, aged twenty-four years, had two children and was thirty weeks pregnant when examined. At thirty-two weeks a Cæsarean section was performed and the baby was sent to an infant hospital. The patient is having intensive X-ray treatment at the Royal Adelaide Hospital for

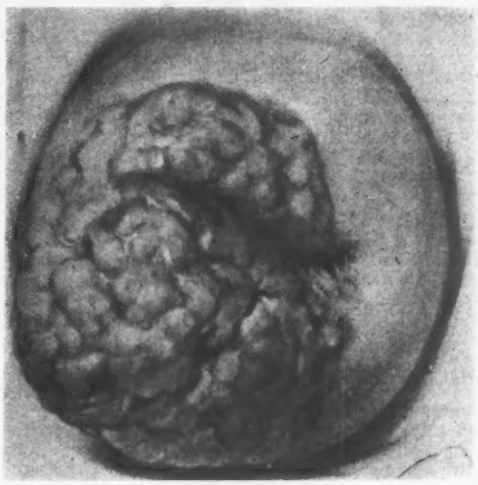

FIGURE IX.
Carcinoma of a later degree, developing Stage II.

about three weeks, after which I shall perform a complete Wertheim's operation. Radium could not be used in this case because of uterine drainage after the emptying of the uterus.[1]

These three cases should have been discovered earlier, and the patients' chances would have been much better. Careful examination in any of these three cases would have led to earlier diagnosis.

I submit to you that the control of pelvic carcinoma is very largely in the hands of the general practitioner.

If the general practitioner makes use of all the available means of investigation of carcinoma of the cervix and uses the clinical information wisely, then far more cases of cervical carcinoma should be diagnosed earlier, and the loss to family and State should be reduced tremendously. Further, we should be able to take our place with those people who have reasonably good results, and the number of unfortunate patients who go to Magill wards merely to await death should be reduced very much indeed. Eventually the awful fear of cancer might be submerged and a less fearful outlook might be held, so that women might submit to earlier examination with reduced terror in the knowledge that cure is probable.

[1] The Wertheim operation has been performed successfully since this paper was written.

Practitioners might be given more post-graduate work here as in Norway, which is a vast area and has a scattered population, much more scattered than in Australia. In Norway the practitioners are paid by the government to take a post-graduate course in pelvic cancer.

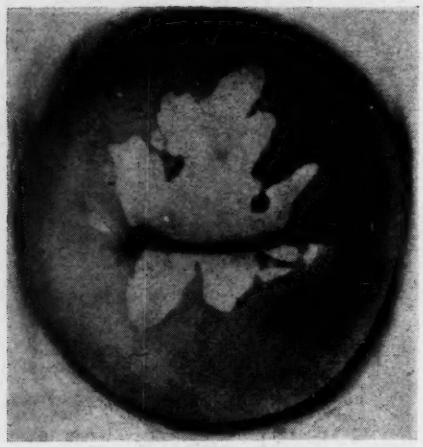

FIGURE V.

Schiller's test, demonstrating area of cells which have no glycogen.

Norway is comparatively poor, especially since the German occupation; but because of early diagnosis the cancer results are amazingly better than ours in South Australia. Practitioners come many hundreds of miles to Oslo to learn to examine a female pelvis carefully both *per*

FIGURE VI.

Epithelial cells with enormous irregular nuclei. The smear is taken from a surface biopsy, and the appearances are regarded as carcinomatous.

vaginam and *per rectum*. They learn to inspect the cervix using a good light and a self-retaining speculum. The practitioner is taught to obtain some guidance from Schiller's test and to make punch and surgical biopsies. If our doctors would make these tests and examinations, it is certain that our cancer morbidity and mortality would be lowered.

In South Australia many patients are examined in a private house, in bed, with a poor light and no speculum, and nothing further is done. This has unfortunately been the case with many patients who were examined at the Royal Adelaide Hospital or in private practice; by the time that they were examined completely a foul discharge and hæmorrhage were present and the condition was beyond cure.

If the history and pelvic examination are unsatisfactory, the patient should be examined at the doctor's rooms with adequate facilities.

The methods of diagnosis of cervical carcinoma are as follows.

1. A careful history is taken and any reference to irregular or contact bleeding or discharge is noted. The so-called menopausal bleeding is an unfortunate fraud; it does not exist. Why medical people talk of menopausal bleeding is beyond comprehension. Menopausal bleeding means that a pathological state exists.

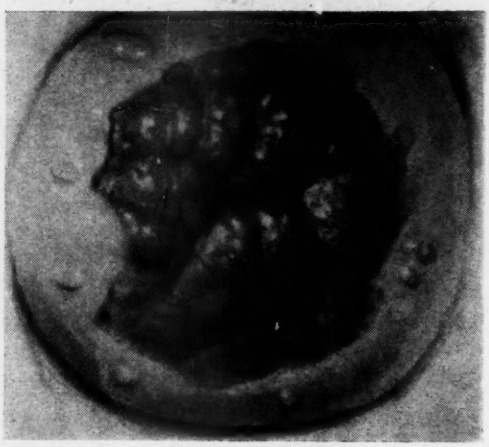

FIGURE VII.

Extensive erosion and Nabothian ovules. Only biopsy can give the final answer "benign" or "malignant" in these cases.

2. A thorough pelvic examination should be made with the patient in the dorsal position and the thighs flexed. A rectal examination should be made also to ascertain whether any parametrial involvement is present.

3. One of the most important examinations is that which is made with a duck-bill self-retaining speculum, with the aid of a good light (Figures I to IV). If there are suspected areas, they may be probed by a uterine sound to test the friability of the cervix. In Switzerland, Germany and Holland the colposcope is used, because this magnifies the area and illuminates the magnified cervix and vaginal vault. This is specialist equipment.

4. The discharge is aspirated from the posterior vaginal fornix, smeared on a slide and stained by the method of Papanicolaou. This is a specialist measure also.

5. A surface biopsy of the cervical epithelium is made by introducing a shaped spatula either of metal or of wood, and rotating it in the external cervical os and so scraping the muco-cutaneous epithelium. This is another specialist measure, and requires a mixture of alcohol and ether in which to place the slides. Positive results indicate preinvasive cancer or carcinoma *in situ*; this is referred to as Stage 0.

6. If a rod with two conical sharpened edges attached is available, these can be made to take out the muco-cutaneous junction by the rotation of one cone edge upon another.

Any practitioner can use this instrument, and it is merely a matter of having one on hand as its use is very simple.

7. Schiller's test is carried out with Lugol's iodine and the pallor of some involved areas is noted. This test can be made by any of you, and can be a useful guide, but will not give a conclusive diagnosis. Schiller showed the results of many such tests, and all the patients who gave positive results were suffering from cancer.

8. A punch biopsy should be made of parts of the cervix which appear to be suspect. This merely requires the snipping off of suspected areas and is quite easy.

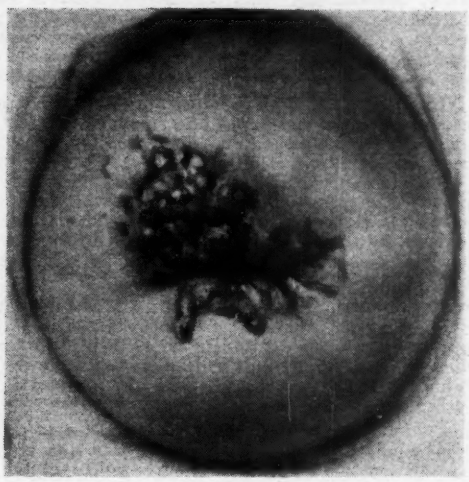

FIGURE VIII.
Early carcinoma, clinically not much different from the appearances in Figure VII.

9. A surgical biopsy is made of any part which may appear abnormal. A wedge is dissected off for pathological examination. The preparation of a biopsy requires the admission of the patient to hospital.[1]

It will be apparent that clinical diagnosis is insufficient; but it is equally apparent that a good view of the cervix will indicate whether further investigation is necessary, especially if there has been any irregular bleeding.

The early diagnosis in most cases depends upon the general practitioner. It is the general practitioner who, if a careful examination is made with a good light, can make a punch biopsy and carry out Schiller's test, or refer the patient to a specialist.

Diagnostic centres such as are found in other parts of the world and have been introduced to Tasmania by Sir Edward Hallstrom would be of great value in Adelaide. At a diagnostic centre appointments could be arranged and inspection of cervices and biopsies of one sort or another could be made. These investigations would not involve the domestic upset of the patient's going into hospital for a few days, and so people would not be put off these investigations on that account. At the centre the biopsies *et cetera* could be taken, but the pathological investigations could be decided on by a competent pathologist.

The public will gradually realize that early diagnosis is of paramount importance, and, as in Switzerland, which has the best cancer results of all recorded countries, people would become anxious to learn the truth. In Zurich, women go along almost as a matter of course, and the fear of the results of investigations, which is said to keep so many women away, is mitigated by the large cure rate, and patients are thus encouraged to seek early investigation.

[1] At this stage Dr. Matters showed a number of slides to illustrate the cytological appearance in some surface biopsies and Papanicolaou's smears. (See Figures V to IX.)

The conclusion which one draws from experience in many countries is that every woman who seeks medical attention for her genitalia should be examined carefully by digital examination and by means of a speculum with a good light.

Within the past four months in the Royal Adelaide Hospital three patients with carcinoma have been admitted to my beds, and the cancer had been overlooked initially.

The first woman had undergone subtotal hysterectomy in another State, and within a month a huge proliferative squamous cell carcinoma of the cervix was found and the patient was referred to the Royal Adelaide Hospital. Radium treatment was begun at once, and a few weeks later a clearance of the pelvis was performed by removal of all the glands, dissection out of the ureters (this being more difficult because of the recent operation) and removal of all the cellular tissue and the cervical stump.

Another patient had had an adenocarcinoma of the vaginal vault, and no follow-up examination had been made after a panhysterectomy. Unfortunately the operation was performed out of Adelaide, and four years later the patient was found to have a vaginal mass of friable tissue.

A third patient, aged twenty-four years, had two children and was thirty weeks pregnant when examined. At thirty-two weeks a Cæsarean section was performed and the baby was sent to an infant hospital. The patient is having intensive X-ray treatment at the Royal Adelaide Hospital for

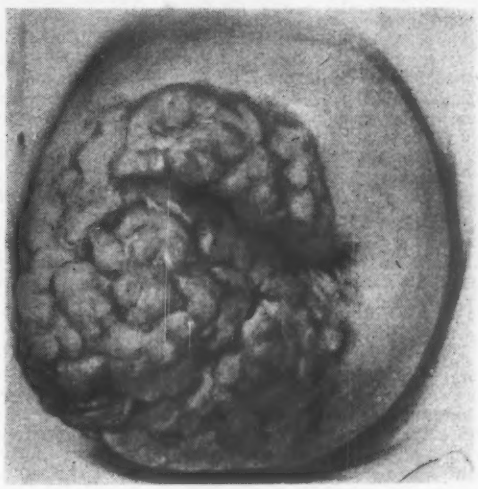

FIGURE IX.
Carcinoma of a later degree, developing Stage II.

about three weeks, after which I shall perform a complete Wertheim's operation. Radium could not be used in this case because of uterine drainage after the emptying of the uterus.[2]

These three cases should have been discovered earlier, and the patients' chances would have been much better. Careful examination in any of these three cases would have led to earlier diagnosis.

I submit to you that the control of pelvic carcinoma is very largely in the hands of the general practitioner.

If the general practitioner makes use of all the available means of investigation of carcinoma of the cervix and uses the clinical information wisely, then far more cases of cervical carcinoma should be diagnosed earlier, and the loss to family and State should be reduced tremendously. Further, we should be able to take our place with those people who have reasonably good results, and the number of unfortunate patients who go to Magill wards merely to await death should be reduced very much indeed. Eventually the awful fear of cancer might be submerged and a less fearful outlook might be held, so that women might submit to earlier examination with reduced terror in the knowledge that cure is probable.

[2] The Wertheim operation has been performed successfully since this paper was written.

THE BIOLOGY OF THE CHILDREN OF HOPEWOOD HOUSE, BOWRAL, NEW SOUTH WALES: I. OBSERVATIONS ON DENTAL CARIES EXTENDING OVER FIVE YEARS (1947 TO 1952).

By B. LILIENTHAL, N. E. GOLDSWORTHY, H. R. SULLIVAN and D. A. CAMERON,

From the Institute of Dental Research,[1] United Dental Hospital of Sydney, Australia.

AMONG the numerous facets of the unsolved problem of dental caries perhaps none has stirred more acrimonious debate than has diet. Unfortunately the word "diet" is often used loosely, and more often still it is confused with "nutrition". Admittedly diet and nutrition are closely linked, but they are by no means identical.

Many observations have been made (for example, Pickerill, 1912; Bunting, 1936; Colyer and Sprawson, 1938; Price, 1945; Mack and Urbach, 1948) on the relationship between diet and the incidence of dental caries, and it is generally accepted that no one particular diet is a *sine qua non* for the development and maintenance of sound teeth. Thus the Eskimo on a diet of protein and fat, the South American gaucho on a diet of protein, the South Sea Islander on a vegetable diet and the Australian aboriginal on a very mixed diet all enjoy a relatively large measure of freedom from dental caries. A mixed diet is also used by so-called civilized peoples, and from time to time observations have been made that, even in those civilized communities where as a rule the prevalence[2] of dental caries approaches 100% (with a correspondingly high D.M.F.[3] value), it is possible so to modify the dietary pattern that the people living on such diets approach or even surpass in excellence the dental conditions of primitive peoples.

The object of this paper is to describe the condition of the teeth of a group of white children living under such controlled conditions in New South Wales.

Hopewood House and its Children.

The 81 children (boys and girls in practically equal numbers), who are the subject of this report, live in rural surroundings on the southern highlands of New South Wales at an elevation above sea level of approximately 2000 feet. The living quarters are in what was formerly a country mansion and its spacious annexes; the buildings are set in 750 acres of undulating grassland. The staffing of the home is more than adequate, and earlier, when as infants the children required more attention, it was on an almost lavish scale.

The children now (February, 1952) range in age from four to nine years. The majority of them have been in the home since the earliest months of life. They are not a selected group, but are almost certainly what is genetically a heterogenous group of European stock.

The type of life led by the children is what is generally described as "healthy"; that is to say, they are well housed and well clothed, and have regular meals and regular exercise under supervision. Those of school age attend school; the younger ones attend a kindergarten within the home itself. As far as possible the children are made to feel that they are a large family living in what is virtually their own home.

Observations.

Diet.

A study of any group of children living under controlled conditions is likely to prove interesting, but our interest in the Hopewood House group was considerably heightened by the fact that these children were "protected" from refined carbohydrates. We therefore made frequent visits to the kitchens, food-stores and dining rooms at meal times, and, although we have not kept a complete record, the diet consisted mainly of wholemeal bread, wholemeal biscuit, wholemeal porridge, wheat germ, fruits (fresh and dried), vegetables (cooked and raw), a small amount of meat,[1] butter, cheese, eggs, milk and fruit juices. This was supplemented with vitamin concentrates, honey or molasses as a sweetening agent on occasion, and nuts (Youth Welfare Association of Australia, Annual Report, 1949).

As far as possible, food was taken uncooked and/or with a minimum of preparation, the idea being to present the food in its natural state. Notable for their absence from the diet were such items as sugar (white and brown), white flour products (including cakes and sweet biscuits) and any combination of these items. No tea was used. The water was drawn from the town supply. This water has been examined (Jones, 1949) for the presence of fluoride, but none was detected. We have not attempted to determine the fluoride content of the foods.

In order to maintain the kind of diet outlined above, those children who attended school were given at midday an appropriately prepared lunch before being allowed to mix with the other children. This was done with the aim of minimizing the danger of their exchanging items of food with other children.

When we began to study the children, attention was given primarily to dental caries. However, the scope of the observations is being broadened so as to obtain, for example, data on their general physical condition and on their hæmatological and biochemical condition. It is enough to state here in general terms that the physical status is (February, 1952) approximately the same as that found in a comparable group of the general population (Clements and Dowd, 1952).

Examination of Oral Structures.

When work began in February, 1947, the teeth were examined by one of us (B.L.) in the ordinary way with mirror and probe. On that occasion also plaster casts were made from the older children. It was not possible (at that time) to make radiographic examinations. In addition to the clinical examination, saliva was collected for bacteriological tests, with special reference to the occurrence of lactobacilli. The technique was similar to that described by Hadley (1933). The saliva was always collected in the early morning before any food had been eaten, and was transported rapidly to the laboratory in Sydney and examined within a few hours of its collection.

Subsequent examinations of the children's teeth have been made approximately twice a year, and from time to time bitewing X-ray pictures have been made to check the results obtained with mirror and probe. The carrying out of the various examinations has been considerably facilitated in recent years by the use of a mobile laboratory-*cum*-clinic.

Results.

The results of the various examinations are set out below.

The figures are based on the results of the last series of examinations made. These were all completed in the period from September, 1951, to February, 1952. It is possible that on occasion there may have been a difference of some months between the last radiographic examination and the last clinical examination. However, in view of the extremely low rate of initiation of new lesions and the slow progress of established lesions, we feel that it is justifiable to group these results together.

[1] We wish to acknowledge the assistance given by the National Health and Medical Research Council of Australia. This body has made grants for the renovation and operation of the mobile laboratory and for the purchase of equipment and supplies.

[2] Prevalence is used to indicate (i) the proportion of persons in a given population who are affected by the disease, or (ii) the number of D.M.F. teeth per child.

[3] D.M.F. value is the total number of decayed, missing and filled teeth. The expressions D.M.F. and D.F. are used in relation to the dentition present at the time of examination, whether or not this was wholly temporary or mixed temporary and permanent. Exfoliated temporary teeth have not been taken into account.

[1] Practically no meat has been included in the diet since 1948-1949.

Prevalence[1] of Dental Caries.[2]

Table I shows the distribution of the children and the prevalence of caries according to age and sex.

Table II shows the prevalence of dental caries expressed in terms of D.F. values.

The distribution of the lesions shows a mode of 2·0.

Although the data presented above are concerned with the state of the teeth at the end of a five-year period, we have examined the children's teeth at intervals during this time. It has therefore been possible to observe the development of the lesions. Throughout the examinations, difficulty has been experienced in establishing with certainty the existence of some lesions. It was the practice firstly to examine the children's teeth with mirror and probe and then to examine the teeth radiologically; any possible lesion detected by either method was recorded. At the next examination particular attention was paid to those areas about whose condition doubt still remained, because of lack of proof from one or other of the methods of examination: radiographs were made at the time and were available to supplement the clinical examination.

TABLE I.
Distribution of Children and Prevalence of Caries According to Age and Sex.

Age in Years.	Number of Children.		Children with Caries.		Children without Caries.	
	Boys.	Girls.	Boys.	Girls.	Boys.	Girls.
4	3	8	0	0	3	8
5	4	6	0	0	4	6
6	0	3	0	0	0	3
7	13	9	4	3	9	6
8	13	12	4	1	9	11
9	6	4	2	4	4	0
Totals ..	39	42	10	8	29	34
	81		18		63	

TABLE II.
Prevalence of Dental Caries (Expressed as D.F. Value) in Each of the 18 Affected Children According to Age and Sex.

Age in Years.	Number of D.F. Teeth.		
	Boys.	Girls.	D.F. Total.
7	1;[1] 1; 2; 3;	3; 4; 6;	20 } 47
8	3; 2; 5; 2;	1;	13 }
9	2; 3;	2; 1; 4; 2;	14 }

[1] This was a deciduous tooth and had been replaced by a permanent tooth at the time of the last examination. No other exfoliated deciduous tooth was carious.

Despite these precautions, certain areas remained in the category "doubtfully carious". Thus in six of the 18 children recorded as having caries the existence of lesions has not with certainty been established, and of the 47 D.F. teeth shown 20 were affected by conditions which belonged to the category of being "doubtfully carious". However, in Tables I and II any tooth which showed such a condition is included as being carious, and all children in whom it was not possible to establish with certainty the absence of caries are classified as having caries. Only three teeth developed lesions which involved more than one surface: these lesions were on a mesial surface and extended onto the occlusal surface. Six amalgam fillings had been inserted, three of them in first permanent molars, apparently by school dentists, as a prophylactic measure. These, with the exception of two doubtful lesions, were the only evidence of involvement of the permanent dentition. No lesion had advanced far enough to expose the pulp of the tooth. In view of these observations over the five-year period we feel that it is justifiable to state that the rate of development of lesions was very slow; indeed, in some teeth the disease may have been arrested.

[1] See footnote (2), page 878.

[2] Pits and fissures were considered to be carious if the probe could be forced into them and remained fast. Smooth surfaces, such as approximal surfaces, were considered to be carious if the probe encountered a softened area or the radiograph revealed decalcification. No lesions were detected on the gingival third of labial and buccal surfaces.

Lactobacillus Counts.[1]

Lactobacillus counts were made at somewhat irregular intervals, but at least once each year, if the child was old enough to cooperate in the procedure. Table III shows the distribution of children without lactobacilli (that is, children who have never given evidence of the presence of lactobacilli), and Table IV the distribution of children with lactobacilli in their saliva (that is, children not certainly free of lactobacilli at the last examination).

TABLE III.
Children without Lactobacilli in Their Saliva at all Examinations: Distribution According to Age and Sex.

Children.	Age in Years.						Totals.
	4	5	6	7	8	9	
Boys ..	2	2	0	2	2	2	10
Girls ..	8	6	1	1	4	0	20
Total	10	8	1	3	6	2	30

The remaining 16 children not shown in Table III or IV were free from lactobacilli in their saliva at the last examination, but lactobacilli had been demonstrated in their saliva at some time previously.

Table V shows the distribution of the counts according to their magnitude and according to the sex of the child. Thirty-six children are recorded as having lactobacilli, the counts ranging from less than 10 to more than 1000. Of these 36 children there were eight in whom the nature of the organism so designated is somewhat doubtful. Only 28 of the 36 children therefore with certainty harboured lactobacilli. Of the 36, 26 had counts of 100 or less.

TABLE IV.
Children not Certainly Free of Lactobacilli in Their Saliva at the Last Examination: Distribution According to Age and Sex.

Children.	Age in Years.						Totals.
	4	5	6	7	8	9	
Boys ..	1	0	0	7	9	2	19
Girls ..	0	0	2	6	5	4	17
Total	1	0	2	13	14	6	36

Association of Lactobacilli and Caries.

The association of lactobacilli and caries is shown in Tables VIA, VIB and VII, on the basis of which was calculated the χ^2 figure of 13·8 indicating statistical significance in the association ($P < 0·001$).

From Table V it appears that of the 36 children with lactobacilli in their saliva, 26 had 100 or less per millilitre.

[1] A lactobacillus count is the number of lactobacilli present per millilitre of a standard 10 millilitre sample of activated saliva. The sample, after measurement of its volume, is serially diluted in broth or peptone water and distributed in 0·1 millilitre quantities over a series of tomato-peptone-agar plates (Hadley, 1933). The colonies are counted after three or four days' incubation at 37° C., and the count is adjusted to represent the number of lactobacilli in a 10 millilitre sample of saliva.

Of these 26, 20 were caries-free, whilst six were affected by caries to the extent of 14 cavities. This is for these 26 children an average D.F. value of 0·54 per child. Of six children with counts of more than 1000 per millilitre, all had caries—20 cavities in all. This is for these six children an average D.F. value of 3·33 per child. These D.F. values are in the ratio of 1:6.

The three highest lactobacillus counts and the corresponding D.F. values are as follows: (i) 400,000 lactobacilli per millilitre, D.F. value six; (ii) 100,000 lactobacilli per millilitre, D.F. value two; (iii) 46,000 lactobacilli per millilitre, D.F. value four. The average D.F. value is four per child.

TABLE V.
Distribution of Lactobacillus Counts According to Magnitude.

Children.	Lactobacilli per Millilitre of Saliva.				Totals.
	1 to 10.	11 to 100.	101 to 1000.	More than 1000.	
Boys	4	9	2	4	19
Girls	6	7	2	2	17
Total ..	10	16	4	6	36

Discussion.

Occurrence of Caries.

The figures given by Cameron (1953) are probably the best for purposes of comparison, because they are based on the examination of children resident in Sydney, New South Wales. He found that 96% of the children in the age-group four to nine years had dental caries and that the average number of D.M.F. teeth per child was approximately nine. Likewise an examination of groups of children aged from five to eight years in New Zealand revealed that 94·5% were affected, and that the average number of D.M.F. teeth per child in a group aged seven to nine years was approximately 11. Figures of the same order are available for the city of Brantford, Canada.

In three New Guinea villages the prevalence among children aged six to ten years was 43%, 85% and 42% respectively, and the average number of D.M.F. teeth per child in the age group six to ten years was 1·64, 3·62 and 1·74 respectively.

The corresponding figures for Hopewood House are: prevalence 22·2% (18 out of 81) and 0·58 D.F. teeth.

Table VIII shows that the children of Hopewood House have approximately one-twentieth the amount of caries experienced by similar groups of white children in Australia and New Zealand, and that their freedom from dental caries is even greater than that enjoyed by the children of three villages in New Guinea.

The small size of the lesions deserves emphasis, and their slow rate of development is noteworthy.

TABLE VIB.
Summary of Data Presented in Table VIA.

Number of Occasions when Lactobacilli Detected.	Proportion of Children with Caries.
0	1 in 30
1	1 in 3·6
2	1 in 5·0
3	1 in 1·5
4	1 in 1·5
5	1 in 2

Lactobacillus Count.

From Table III it can be seen that 30 out of the 81 children had never had any lactobacilli in their saliva, whereas (Table IV) 36 of the children have not been proven certainly free of lactobacilli at the last examination made.

TABLE VII.
Relation at the Last Examination of the Presence of Lactobacilli to the Occurrence of Caries.

Lactobacilli.	Caries Present.	Caries Absent.	Totals.
Present	15	21	36
Absent	3	41	44
Totals ..	18	62	80[1]

From these figures $\chi^2 = 13·8$ and $P < 0·001$.

[1] The disparity between totals 80 and 81 is due to the fact that complete data were not available for one of the 81 children.

Frequently the numbers were very small, and Table V shows that 26 out of 36 children had counts of 100 or less, and only six of the 36 had counts of more than 1000. It is generally considered (Hadley, 1933) that such low counts of 100 or less do not indicate susceptibility to the disease.

TABLE VIA.
Caries Experience of Children According to the Presence of Lactobacilli During the Five-year Period. (Caries Experience Expressed as D.F. Value of Each Child.)[1]

Age in Years.	Lactobacilli Present on												Total Number of Children.
	No Occasion.		One Occasion.		Two Occasions.		Three Occasions.		Four Occasions.		Five Occasions.		
	Boys.	Girls.	Boys.	Girls.	Boys.	Girls.	Boys.	Girls.	Boys.	Girls.	Boys.	Girls.	
4	0; 0	0; 0; 0; 0; 0; 0; 0; 0	0	—	—	—	—	—	—	—	—	—	11
5	0; 0	0; 0; 0; 0; 0; 0	0; 0	—	—	—	—	—	—	—	—	—	10
6	—	0	—	0	—	0	—	—	—	—	—	—	3
7	0; 0	0	0; 3; 2; 0; 1; 0	0; 6	0; 0	3; 0; 0; 0	0	—	1; 0	4; 0	—	—	22
8	0; 0	0; 0; 0; 0	0; 0; 0; 0; 2; 0	0; 0; 0; 1; 0	0; 0	0; 0; 0	5	—	2; 1	—	3	—	25
9	3; 0	—	0; 2	—	0	2; 1	—	4	—	2	0	—	10
Total number of children.	10	20	17	8	5	10	2	1	3	3	2	0	81
	30		25		15		3		6		2		

[1] It should be noted that, owing to a variety of circumstances (for example age), not every child has been examined five times. Hence the younger children will tend to show less evidence of the presence of lactobacilli in addition to being less likely to have caries.

TABLE VIII.

Comparison of Prevalence of Caries and of D.M.F. Values for Various Groups of Children in Approximately the Same Age Groups.

Place and Authority.	Prevalences of Caries.			D.M.F. Values.		
	Age Group. (Years.)	Number of Children in Group.	Percentage of Persons Affected.	Age Group. (Years.)	Number of Children in Group.	Average Number of D.M.F. Teeth per Child.
Sydney, Australia (Cameron, 1953)	4 to 9	554	96·0	4 to 9	554	9·57
New Zealand (Hewat, 1948, 1952)	5 to 8	923	94·5	7 to 9	313	11·38
Hopewood House, Bowral, Australia	4 to 9	81	22·2	4 to 9	81	0·58
Brantford, Ontario, Canada (Hutton *et alii*, 1951)	5 to 9	2712	92·1	5 to 9	2712	8·00
New Guinea Villages (Sinclair *et alii*, 1950):						
Pátep II	6 to 10	14	42·9	6 to 10	14	1·64
Kavataria	6 to 10	13	84·6	6 to 10	13	3·62
Korovagi	6 to 10	19	42·1	6 to 10	19	1·74

Some authorities (Dewar, 1949, 1950) have even suggested that counts of less than 1000 lactobacilli can be regarded as compatible with relative immunity to caries.

Association Between the Occurrence of Lactobacilli and Caries.

Table VII is a simple four-fold table which establishes statistical significance in the association between lactobacilli and caries. In the construction of the table, all possible lesions (certain and doubtful) have been included. Likewise, figures for the occurrence of lactobacilli include doubtful results. In adopting this procedure we have weighted the evidence against ourselves. Similarly no attempt has been made to exclude the low lactobacillus counts of 100 or less, despite the fact that such small numbers are frequently regarded as having no significance in relation to the existence of carious lesions.

Further, the figures given at the end of the section "Results" appear to indicate a quantitative relationship between the lactobacillus count and the D.F. value, when a group rather than an individual is being considered. The foregoing conclusion is drawn with a realization that the lesions are probably in their initial and active phases—there were no large, open cavities.

Association Between Diet and Caries.

As was mentioned in the introduction, a number of authorities have drawn attention to the apparent association between diet and the development and maintenance of sound teeth. In the majority of cases the kind of diet compatible with sound teeth is one in which the food is eaten in as natural a form as possible—that is to say, with as little processing, refinement and cooking as possible. This is precisely the situation at Hopewood House. A brief description of the types of food eaten has been given earlier in the paper.

Summary and Conclusions.

1. In a population of children living under certain controlled conditions, 63 out of 81, whose ages range from four to nine years, were free from caries (Table I). The proportion of children without caries is far in excess of the proportion of children without caries in three New Guinea villages and in groups examined in Australia, New Zealand and Canada (Table VIII).

2. The teeth of the children in this group of 81 are remarkable for the very small number of carious lesions. The average D.F. value per child (0·58) is lower than that for the children of approximately the same age group in three New Guinea villages (Table VIII).

3. No child had more than six lesions (Table II).

4. The rates of initiation of new lesions and of the progress of established lesions are very much below the rates in the general population.

5. Lactobacilli are present in the group and occur in some children as permanent components of the oral flora and in others apparently as transients. From one child with caries no lactobacilli could be isolated, and in 16 without caries lactobacilli have been detected on more than one occasion. Despite these discrepancies there is a statistically significant association between the occurrence of lactobacilli (irrespective of the count) and caries.

6. The outstanding difference in the environment as between this group of children and groups living in the population at large is in the nature of the diet. Foods containing refined carbohydrates (for example, sugar, white flour) are either excluded from the diet or eaten in very small amounts.

Acknowledgements.

We wish to thank especially Mr. L. O. Bailey, President and Founder of the Youth Welfare Association of Australia, under whose direction Hopewood House is conducted, and the staff of the home for their generous assistance in making possible the observations reported in this paper; also Dr. H. O. Lancaster, Honorary Consultant Statistician, who has kindly read the manuscript and checked the calculations. We also acknowledge assistance given in the laboratory by several members of the graduate and technical staff of the Institute of Dental Research.

References.

BUNTING, R. W. (1936), "Report of the Michigan Group Researches on Dental Caries", *Berichte erstattet am IX. Internationalen Zahnarztekongress der F.D.I.*, Vienna.

CAMERON, D. A. (1953), "An Investigation of the Caries Experience and Diet of Groups of School and Pre-school Children in Sydney (1946)", in the press.

CLEMENTS, F. W., and DOWD, B. (1952), private communication.

COLYER, J. F., and SPRAWSON, E. (1938), "Dental Surgery and Pathology", Seventh Edition, London.

DEWAR, M. R. (1949), "Laboratory Methods for Assessing Susceptibility to Dental Caries, Part I", *Dent. J. Australia*, 21: 509.

DEWAR, M. R. (1950), "Laboratory Methods for Assessing Susceptibility to Dental Caries, Part II", *Dent. J. Australia*, 22: 24.

HADLEY, F. P. (1933), "A Quantitative Method for Estimating Bacillus Acidophilus in Saliva", *J. Dent. Res.*, 13: 415.

HEWAT, R. E. T., (1948), "Field Studies on Dental Caries in New Zealand", *New Zealand Dent. J.*, 44: 163.

HEWAT, R. E. T. (1952), private communication.

HUTTON, W. L., LINSCOTT, B. W., and WILLIAMS, D. B. (1951), "The Brantford Fluorine Experiment: Interim Report after Five Years of Water Fluoridation", *Canad. J. Pub. Health*, 42: 81.

JONES, P. B. (1949), "The Fluorine Content and Other Chemical Characteristics of Potable Waters in New South Wales", *Dent. J. Australia*, 21: 231.

MACK, P. B., and URBACH, C. (1948), "A Study of Institutional Children with Particular Reference to the Caloric Value as well as Other Factors of the Dietary", "Monographs of the Society for Research in Child Development", 13: 1. (Abstracted in *Nutrition Abst. & Rev.* (1950), 19: 678.)

PICKERELL, H. P. (1912), "The Prevention of Dental Caries and Oral Sepsis", First Edition, London.

PRICE, W. A. (1945), "Nutrition and Physical Degeneration. A Comparison of Primitive and Modern Diets and Their Effect", Fourth Printing, enlarged, Los Angeles, California.

SINCLAIR, B. Y., CAMERON, D. A., and GOLDSWORTHY, N. E. (1950), "Some Observations on Dental Conditions in Papua-New Guinea, 1947, with Special Reference to Dental Caries", *Dent. J. Australia*, 22: 58, 120.

YOUTH WELFARE ASSOCIATION OF AUSTRALIA (1949), Annual Report, page 18, Sydney.

ANTERIOR DISLOCATION OF THE SHOULDER: REDUCTION BY THE "HANGING-ARM" TECHNIQUE.

By GORDON KERRIDGE,
Department of Orthopædics, Royal Newcastle Hospital, Newcastle.

THE techniques described for the purpose of reducing anterior dislocations of the shoulder are legion, and any of them are satisfactory in the hands of one familiar with the method. It is thought, however, that the manœuvre to be described, the "hanging-arm" technique, offers advantages over all others. The manipulation is simple, and the patient suffers little discomfort. In this series no patient required morphine or anæsthesia.

FIGURE I.

FIGURE II.

The method is a modification of the abduction technique used by Milch, and is almost identical with that recently described by Lacey and Crawford. The manœuvre was attempted in the treatment of 26 successive patients suffering from anterior dislocation of the shoulder. There was no selection of patients. The ages of the patients ranged from seventeen to seventy-nine years. Four had sustained a previous dislocation, in each case general anæsthesia having been administered for the reduction. All the dislocations were recent with one exception, the patient being a man who sought treatment thirty-six hours after his accident. In 24 cases in this series, reduction was successful. Neither morphine nor anæsthesia was required. The remaining two patients were aggressively alcoholic and refused to adopt the prone position. The method could not be continued, and these cases are therefore recorded as failures.

FIGURE III.

FIGURE IV.

The steps of the manipulation are illustrated in the photographs. The patient lies prone, the arm being allowed to swing freely over the side of the couch (Figure I). He is encouraged to relax and is found to experience considerable immediate relief of pain. Spontaneous reduction may occur at this time.

After a short period, during which the importance of complete relaxation is explained to the patient, the elbow is flexed to 90° (Figure II). This relaxes the long head of the biceps, which tends to maintain dislocation. Again, spontaneous reduction may now occur.

The surgeon now grasps the patient's elbow, his forearm supporting that of the patient. Gentle continuous traction is applied, and the arm is turned slowly into abduction and external rotation. The surgeon's contralateral hand,

holding the upper portion of the brachium, increases this gentle abduction and external rotation movement (Figure III). In practically all cases reduction occurs at this stage.

If success has not yet been achieved, the surgeon gently lifts the head of the humerus over the glenoid with the hand supporting the brachium, at the same time maintaining longitudinal traction (Figure IV).

The importance of gentleness at all stages in this manœuvre cannot be over-stressed. Usually it is almost impossible to be certain at which stage reduction has occurred. Several patients have been heard explaining to their companions that the shoulder had "gone back by itself while the doctor was examining it".

Bibliography.

LACEY, T., and CRAWFORD, H. (1952), "Reduction of Anterior Dislocations of the Shoulder by Means of the Milch Technique", *J. Bone & Joint Surg.*, 34a: 108.
MILCH, H. (1938), "Treatment of Dislocation of the Shoulder", *Surgery*, 3: 732.

DEVELOPMENT OF ISONICOTINIC ACID-HYDRAZIDE RESISTANCE IN MYCOBACTERIUM TUBERCULOSIS: PRELIMINARY PUBLICATION.

By J. S. INCZE,
Wooroloo, Western Australia.

WHEN isonicotinic acid-hydrazide was first used for the treatment of patients at the Wooroloo Sanatorium very little literature was available about this drug and none was available at all about the development of resistance to it by the tubercle bacillus. However, it was decided to investigate the latter.

At that time we had no intention of publishing this work, and the dilutions of the drug in the culture medium were frequently varied to find the optimum concentration that would completely inhibit growth of the organism.

Methods.

The method of investigation was as follows.

At the beginning we made dilutions of isoniazid of 0·015 milligramme per cubic centimetre (which has been given as the lowest level of concentration able to inhibit the growth of *Mycobacterium tuberculosis in vitro* (Maggioni) and then increased the dilution to a maximum concentration of 0·20 milligramme per cubic centimetre.

Later we increased the range, some concentrations being intermediate between those mentioned above, and others higher, the variations including the following, in milligrammes per cubic centimetre: 0·015, 0·06, 0·20, 0·40, 0·60, 1·0, 2·0 and 3·0.

At first we put up the sputum or sinus discharge on Löwenstein medium; from the culture growth we made subcultures on liquid medium containing isoniazid. Later we modified this system, using specimens giving positive results on direct smear examination or concentration, treated with 3·46% sulphuric acid for thirty-five minutes and neutralized by a 10% solution of sodium hydroxide, without being passed through an intermediate culture.

The medium used for test was Youmans's fluid medium (Youmans, 1944) with slight modification; instead of human serum we added 10% normal horse serum. We kept the inoculated tubes at 37° C.; if no growth was detected in forty-five days we discarded the tubes as "negative". Any growth we carefully examined to exclude other organisms or to verify the presence of tubercle bacilli.

Results.

A total of 69 cases were tested to determine the period of time necessary for resistance to the drug to develop.

With the exception of two patients treated by combined streptomycin, PAS and isoniazid therapy, all other patients were treated by means of isoniazid alone. The dosage used was 200 milligrammes daily divided into four equal doses.

We found that during the first six weeks of treatment resistance to isoniazid developed as follows: 0·015 milligramme per cubic centimetre, nine cases; 0·06 milligramme per cubic centimetre, nine cases; 0·20 milligramme per cubic centimetre, five cases; 0·6 milligramme per cubic centimetre, one case; 2·0 milligrammes per cubic centimetre, one case.

After twelve weeks of treatment, in addition to the foregoing, four other patients developed resistant organisms to 0·015 milligramme of isoniazid per cubic centimetre, four to 0·20 milligramme per cubic centimetre, two to 0·4 milligramme per cubic centimetre, and one to 3·0 milligrammes per cubic centimetre.

After eighteen weeks of treatment a further two patients developed resistant organisms to 0·06 milligramme of isoniazid per cubic centimetre, three to 0·6 milligramme per cubic centimetre, and one to 3·0 milligrammes per cubic centimetre.

This showed that in eighteen weeks, of 69 patients 13 had developed organisms resistant to 0·015 milligramme of isoniazid per cubic centimetre, 11 to 0·06 milligramme of isoniazid per cubic centimetre, nine to 0·20 milligramme per cubic centimetre, two to 0·4 milligramme per cubic centimetre, one to 1·0 milligramme per cubic centimetre, and two to 3·0 milligrammes per cubic centimetre, which gives a total of 44 out of 69 (see Table I).

TABLE I.
Development of Organisms Resistant to Isoniazid in 69 Patients.

Concentration of Isoniazid. (Microgrammes per Cubic Centimetre.)	Number of Patients Developing Resistant Organisms.			
	6 Weeks.	12 Weeks.	18 Weeks.	Total at 18 Weeks.
0·015	9	4	—	13
0·06	9	—	2	11
0·20	5	4	—	9
0·40	—	2	—	2
0·60	1	—	3	4
1·0	—	—	1	1
2·0	1	—	—	1
3·0	—	1	2	3
Totals ..	25	11	8	44

Discussion.

If it is accepted that growth in concentrations of 0·015 milligramme and 0·06 milligramme of isoniazid per cubic centimetre is not clinically important, but that growth in a concentration of 0·20 milligramme per cubic centimetre is significant, even then 20 of the 69 treated patients developed this or a higher level of resistance during the period of this investigation.

There are not sufficient data available to make it possible to decide the level of resistance beyond which no further clinical improvement may be expected. This matter is in process of investigation in this laboratory.

We are continuing work according to the following plan. The bacilli from every patient prior to beginning the treatment with isoniazid will have a bacteriological sensitivity test carried out. From the beginning of the treatment fortnightly tests will be made to check the appearance of the resistant strains, the following concentrations being applied (all in microgrammes of isoniazid per cubic centimetre): 0·02, 0·06, 0·24, 0·5, 1·0, 3·0, 6·0, 20·0 and 100·0.

Further experiments are being carried out with reference to the development of isoniazid-resistant strains in the treatment of patients on combined drug therapy (streptomycin, PAS and isoniazid).

Conclusion.

We have been able to demonstrate the development of resistant strains of *Mycobacterium tuberculosis*, employing different concentrations of isoniazid in Youmans's media. This resistance has been demonstrated by other authors.

Acknowledgement.

I should like to express my thanks to Dr. H. R. Elphick for his help with this work, and to Dr. Alan King, State Director of Tuberculosis Control, for permission to publish this paper.

Bibliography.

FISHER, M. W. (1952), "The Altered Growth Characteristics of Isoniazid-resistant Tubercle Bacilli", *Am. Rev. Tuberc.*, 66: 621.

MAGGIONI AND COMPANY, LIMITED, MILAN, Pamphlets.

"Treatment, The, of Pulmonary Tuberculosis with Isoniazid: An Interim Report to the Medical Research Council by their Tuberculosis Chemotherapy Trials Committee" (1952), *Brit. M.J.*, 2: 735.

WIESMANN, E., WANNER, J., and TANNER, A. (1952), *"Erste Beobachtungen von Rimifon-Resistenz"*, *Schweiz. med. Wchnschr.*, 82: 785.

YOUMANS, G. P. (1944), "Improved Method for Testing of Bacteriostatic Agents using Virulent Type Tubercle Bacilli", *Proc. Soc. Exper. Biol. & Med.*, 57: 122.

PORT AUGUSTA MENINGITIS.

By J. A. R. MILES and D. M. SURREY DANE,[1]

The Institute of Medical and Veterinary Science, Adelaide.

IN July and August, 1952, there was an epidemic of aseptic meningitis in Port Augusta in South Australia. Except in one case, the disease was mild and of short duration. In the last case, the child, a mongol, thirteen months old, died in the Adelaide Children's Hospital, and through the kindness of Dr. Ruth Osmond, we received parts of the brain for investigation.

Dr. J. S. Covernton, in whose care were those patients admitted to Northfield Infectious Diseases Hospital, and who drew our attention to the epidemic, sent specimens of serum while the patients were in hospital; and Dr. J. R. Thompson, of Port Augusta, sent us later specimens.

Through the good offices of Dr. Thompson, Dr. Covernton and ourselves have been able to investigate the course of the epidemic. The results of these investigations will be reported later.

In this communication we report the isolation of a virus from the brain in the fatal case, and give the evidence from which we conclude that this virus is likely to have been responsible for the epidemic.

Isolation of the Virus.

Cerebro-spinal fluid, meninges, and pieces of the medulla, pons, cerebellum, basal ganglia and cortex of the fatal case were pooled, ground with sand in a mortar, and made up to a 20% suspension in serum saline, extracted two hours in the cold room and centrifuged for ten minutes at 2000 revolutions per minute in saline.

The supernatant showed gross bacterial contamination, and therefore 500 units of penicillin and streptomycin per millilitre of extract were added before the material was inoculated into animals and eggs.

A monkey received 0·5 millilitre by intracerebral and 0·5 millilitre by direct inoculation into the parotid gland. No evidence of infection was found, and the animal did not develop antibodies to mumps virus.

Eggs were inoculated by various routes, but despite the addition of antibiotics to the inoculum, all died from bacterial contamination.

Weaned and suckling mice inoculated intracerebrally and intraperitoneally showed no evidence of infection.

Because of the report of Schwartzman and Fisher (1952) that hamsters showed a greatly increased susceptibility to infection with Type 2 poliomyelitis virus, when pretreated with cortisone, we also tried a group of six three weeks old mice treated with one milligramme of cortisone intramuscularly on two successive days, followed by the inoculation of 0·03 millilitre of brain suspension intracerebrally and 0·1 millilitre intraperitoneally. Two of these mice died forty-eight hours after inoculation. Their brains showed gross bacterial contamination. Another was killed when sick on the third day, and two more when sick on the fifth day. Their brains were sterile on aerobic culture. The last mouse appeared sick from the eighth to the seventeenth day, but recovered.

The material was passed as a 20% brain suspension to further cortisone pretreated mice for four passages, and the fifth passage was found to kill normal mice in approximately the same time as it killed the cortisone pretreated animals.

Characteristics of the Virus.

Size.—The virus is of very large size. It passed through gradocol membranes having an average pore diameter of 750mμ or 600mμ but was held up by a membrane of 390mμ average pore diameter. Even at 750mμ there was a considerable loss of virus during filtration. The results suggest an elementary body size of 300mμ to 500mμ; centrifugation at an R.C.F. of 5000 grammes for one hour deposited, on the average, about 99% of active virus. Smears of yolk sac heavily infected with virus when stained by Giemsa or Machiavello's stain showed numerous round bodies of the order of size expected, looking not unlike the elementary bodies of psittacosis group viruses.

Bacteriological Culture.—Culture aerobically, anaerobically, and under 10% carbon dioxide at 37° C., 30° C., and at room temperature for periods up to three weeks failed to yield any growth. The following media were tested: blood agar, chocolate agar, serum agar, Fildes medium, broth, serum broth, cooked meat, sloppy agar, Sabouraud's medium, and Korthof's medium for leptospiræ.

All media were tested on the brains of each of six mice killed when moribund from the disease.

Pathogenicity for Laboratory Animals.

Mice.—When large or moderate doses were passed intracerebrally in weaned mice, the animals showed signs of illness on the third or fourth day. They sat huddled up with rough coats and showed exaggerated response to handling. They commonly developed convulsions and might die acutely in the convulsion. They normally died within twenty-four to forty-eight hours of the first symptom, without ever showing paralysis. Histologically the main finding was an intense predominantly mononuclear meningitis.

Mice were also readily infected by the intranasal route, but only poorly by the intraperitoneal, and occasionally after intramuscular inoculation. Mice killed when sick after intraperitoneal inoculation showed no meningitis, but a moderate or severe myositis.

Suckling mice were substantially less susceptible than weaned mice. For example, a batch of material which, on the average, killed twenty-one day old mice on the fifth day, killed twenty-four hour old mice on the tenth day, and seven day old mice on the twelfth day.

Guinea-pigs.—Guinea-pigs inoculated intracerebrally or intramuscularly with mouse brain material were febrile for three to five days following inoculation, either intracerebrally or intraperitoneally, with mouse-brain suspension of virus. They began to show signs of hind-leg weakness between the tenth and twentieth days after inoculation, and usually died five to seven days after definite signs appeared. They became very wasted, but did not develop complete paralysis of any limb. At post-mortem examination these guinea-pigs, regardless of the route of inoculation, showed gross and widespread myositis, but either minimal meningitis or no abnormality of brain or meninges.

Rabbits became febrile for three days immediately after inoculation, but did not show ill health at any stage. They developed complement-fixing antibodies against the virus.

Embryonated Hens' Eggs.—The virus became adapted readily to passage in the yolk sac of the embryonated hen's egg, and after three passages numerous round basophilic bodies of about 0·5μ in diameter were seen in Giemsa-stained smears from the yolk sac of eggs dying five to seven days after inoculation. This material passed back into mice caused the typical disease. Continued yolk sac

[1] Assisted by a grant from the National Health and Medical Research Council.

passage led to earlier deaths and the appearance of more elementary bodies in stained smears.

The virus did not multiply readily when inoculated onto the chorio-allantoic membrane of ten to twelve day old embryonated hens' eggs.

Serological Tests.

Neutralization Tests.—Neither the sera of experimental animals (monkey, guinea-pig and rabbit) nor those from human patients suspected of suffering from meningitis due to this virus gave any evidence of the presence of neutralizing antibody against the virus under any conditions tested.

Complement-fixation Test.—An antigen was prepared from the yolk sacs of embryonated hens' eggs inoculated with the virus. After six days' incubation fertile eggs were inoculated into the yolk sac with 0·1 millilitre of a 20% suspension of eighth passage yolk sac material containing 1000 units per millilitre of penicillin and streptomycin. The eggs were harvested when they died on the fifth to seventh day after inoculation. The yolk sacs were suspended in M/50 phosphate buffer and shaken with glass beads. This material was allowed to extract overnight at +4° and then a partially purified suspension of virus was prepared by differential centrifugation. This was used as an antigen in complement fixation tests performed on the sera of the experimental animals which had been inoculated with the virus, and on sera obtained from the Port Augusta patients. The tests were carried out, two minimum hæmolytic doses of complement and a five-volume technique being used. After fixation overnight at +4° C., 3% sheep's cells and five minimum hæmolytic doses of hæmolysin were added and the test incubated at 37° C. for half an hour. A psittacosis yolk sac antigen made by a similar technique was used instead of a normal yolk sac control. The results obtained with the human sera from Port Augusta are shown in Tables I and II. Of the experimental animals

TABLE I.
Titre of Complement Fixation Test with Sera from Cases in the Port Augusta Epidemic.

Case.	Acute.		Convalescent.		Late.	
	Time After Onset.	Titre.	Time After Onset.	Titre.	Time After Onset.	Titre.
L.C. ..	Day 14	1 : 20		Not tested.	5 months	1 : 40
L.S.McG.	Day 10	0	Day 56	1 : 10	6 months	1 : 20
B.McK.	Day 5	1 : 40		Not tested.	6 months	1 : 40
P.McK.	Day 4	0	Day 26	0		Not tested.
D.M. ..	Day 7	0	Day 29	0	6 months	1 : 20
S.McD.	Day 9	±1 : 5	Day 31	1 : 40	6 months	1 : 40

inoculated with the virus, the monkey gave a positive titre of 1 in 160 and the rabbit a titre of 1 in 40. So far we have been unable to demonstrate the development of complement-fixing antibodies in guinea-pigs inoculated with the virus. One of us now has a titre of 1 in 40 against the Port Augusta virus, but unfortunately no earlier specimen of serum is available for comparison.

Another antigen was prepared from the brain of weaned mice inoculated intracerebrally with the virus. The brains were ground with silica in a mortar and allowed to extract overnight at +4° C. A partially purified suspension of virus was then obtained by differential centrifugation. Positive sera reacted to a lower titre with this antigen than with the yolk sac antigen. Heating the antigen for half an hour in a boiling water bath did not alter its reactivity, and both heated and unheated antigen failed to react with a pigeon serum giving a complement-fixing titre of 1 in 64 with psittacosis group antigen. Serum from the monkey hyperimmunized with Port Augusta virus did not fix complement with psittacosis group antigen. A further 38 pairs of sera from patients with signs of meningeal irritation or meningitis (not from Port Augusta) have also been tested. Three of these are definitely positive, seven more gave doubtful reactions, and the remaining 28, including two cases of mumps meningo-encephalitis, were negative.

Discussion.

In this report we have described an agent which will pass through filters holding back bacteria, which is resistant to penicillin and streptomycin, and which we have failed to grow on a variety of bacteriological media under several different conditions. The agent is of the order of size of, and morphologically similar to, the psittacosis group viruses, but is not related serologically to psittacosis. The type of reaction is unlike that ordinarily caused by the

TABLE II.
Titre of Complement Fixation Test with Various Antigens.

Case.	Specimen.	Port Augusta Meningitis.	Psitta-cosis.	Mumps "V" Antigen.	Lympho-cytic Chorio-meningitis.
L.C. ..	Acute ..	1 : 20	0	1 : 20	1 : 10
	Late	1 : 40	0	1 : 10	1 : 10
L.S.McG.	Acute ..	0	0	1 : 10	0
	Convalescent ..	1 : 10	0	1 : 20	0
B.McK.	Acute ..	1 : 40	0	0	1 : 5
	Convalescent ..	Not tested.	Not tested.	0	1 : 10
	Late	1 : 40	0	Not tested.	Not tested.
P.McK.	Acute ..	0	0	1 : 20	0
	Convalescent ..	0	0	1 : 20	0
D.M. ..	Acute ..	0	Not tested.	1 : 10	0
	Late	1 : 20	0	1 : 10	0
S.McD.	Acute ..	0	0	0	0
	Convalescent ..	1 : 40	0	0	0

pleuropneumonia group of organisms, and we are of the opinion that a pleuropneumonia should have grown under some of our conditions of culture. Because of all these things we have referred to this agent as a virus.

As such its pathogenicity pattern is peculiar. It causes meningitis and myositis in mice, but more readily in weaned than in suckling animals. It causes myositis in guinea-pigs. In man it may apparently cause a meningitis and, at least in the laboratory, inapparent infection with the development of complement-fixing antibodies. It is apparently unrelated serologically to mumps and lymphocytic choriomeningitis. At present we are unable to place it in any of the recognized groups.

With our present complement-fixing antigen we have not succeeded in finding a high titre in any sera, but in three of six cases of disease occurring at the same time as the fatal case and thought to be from the same epidemic, we have found a rising titre. In two others antibody was present in both early and late sera, while in the sixth case no antibody was present in acute or convalescent sera. No late serum was available from this case. There is no serological evidence that these were cases of mumps (which was present in Port Augusta at the time) or of lymphocytic choriomeningitis.

The amount of active material present even in our best antigen does not yet appear to be optimal, but the results we have obtained strongly suggest that the virus was the cause of the infections from which our sera were taken.

Summary.

1. A virus has been isolated on the first passage in cortisone pretreated mice inoculated with the brain from a fatal case of aseptic meningitis.

2. This virus has a probable elementary body size of 0·3μ to 0·5μ. It is resistant to penicillin and streptomycin.

3. It causes a mononuclear meningitis and myositis in weaned mice and a myositis in guinea-pigs.

4. It is not serologically related to psittacosis, mumps or lymphocytic choriomeningitis.

5. In the mammals tested it does not give rise to neutralizing antibodies, but does give rise to complement-fixing antibodies.

6. Complement-fixation tests on sera from patients affected in the same outbreak as the fatal case suggest that this virus was the cause of the epidemic.

Acknowledgements.

We wish to record our thanks to Dr. J. S. Covernton for drawing our attention to the epidemic and for much help; to Dr. J. R. Thompson for generous assistance; to Dr. Hilary Koprowski, of Lederle Laboratories Division, for the supply of lymphocytic choriomeningitis antigen, and to Mr. B. W. Moore for his technical assistance.

Reference.

SCHWARTZMAN, G., and FISHER, A. (1952), "Alteration of Experimental Poliomyelitis Infection in the Syrian Hamster with the Aid of Cortisone", *J. Exper. Med.*, 95: 347.

Reports of Cases.

A COMPLICATED ANEURYSMAL VARIX OF THE FEMORAL ARTERY TREATED BY ARTERIAL SUTURE.

By J. T. HUESTON,
Major, Royal Australian Army Medical Corps.

IN the surgery of major arterial injury the guiding principle will always be to save life, and, if possible, the limb. With modern methods of resuscitation being carried further forward in the field, many lives are being saved by early and adequate blood replacement. Thus, relieved of the immediate dangers of blood loss, the surgeon is confronted more frequently with the problem of preserving the limb in the presence of severe vascular injury.

Although primary repair is rarely possible in war wounds of the major peripheral arteries, Mason Brown (1946, 1948) has shown that good results can be obtained. As one would expect, the results following repair of longer-standing lesions are even more promising (Heringman, 1947).

In the present case there was severe arterial damage together with certain destruction of the main collateral vessels. The maintenance of the main arterial stream was almost certainly responsible for preserving the limb.

Clinical Record.

A British Commonwealth soldier, Private F.D., aged twenty-two years, was wounded in action in Korea on August 31, 1952, sustaining a shrapnel wound in the left femoral triangle. He managed to walk some distance and was in a state of severe shock when examined by the regimental medical officer. The bleeding was controlled by a firm dressing, and evacuation proceeded by ambulance jeep to the casualty collecting post, where a blood transfusion was begun. When his general condition improved, an American helicopter carried the patient to a mobile army surgical hospital where, after a further transfusion of three pints of blood, his wound was debrided. It was recorded that at operation the hæmorrhage had ceased and no injury to major vessels was detected; the peripheral pulses were present. The wound was left unsutured and the patient was evacuated through Seoul to Japan by air.

He arrived at the British Commonwealth General Hospital, Kure, on September 4, four days after being wounded. The wound was closed by delayed primary suture on the following morning. It was clean and dry, only two inches long, and the femoral vessels were not seen. Because the hæmoglobin level was 56% (8·3 grammes *per centum*) on his admission to hospital, three pints of blood were given by transfusion.

Post-operatively there was mild wound infection with *Pseudomonas pyocyanea*, but the soft tissues healed satisfactorily so that the sutures were removed on the tenth day. The patient had become ambulant by this time, and drew attention to a painful lump at the site of the wound, which had appeared within a few hours of the removal of the skin sutures.

The swelling was about one and a half inches across, pulsatile but not expansile, with a palpable systolic thrill, and on auscultation a continuous "machinery" murmur was present and conducted along the line of the femoral vessels to the adductor tubercle. The pulse was present at the ankle and appeared equal in volume to that on the other side. The blood pressure was 160 millimetres of mercury, systolic, and 70 millimetres, diastolic, and the pulse rate was 90 per minute; the heart was not clinically or radiologically enlarged.

A major arterio-venous fistula was diagnosed and the swelling was observed closely over the following hours. After six hours it was clear that the swelling had increased in size, the pain was worse and radiating down to the knee and the patient was aware of a coarse buzzing in the lump. The blood pressure had changed to 180 millimetres of mercury, systolic, and 60 millimetres, diastolic, and the pulse rate had risen to 120 per minute. The pulse at the ankle was palpable but diminished in volume. On this evidence of rapidly increasing size of the lesion an urgent operation was performed.

An incision was made, nine inches long, in the line of the femoral artery and beginning one inch above Poupart's ligament. It included the previous wound, which began two inches below this ligament.

The femoral artery was exposed as it emerged under Poupart's ligament and a tape passed around it; it was again exposed in Hunter's canal and another tape was passed around it. The sac of the false aneurysm was formed in front by *fascia lata* and the sartorius muscle. The sac was incised while the tapes were held taut. Bleeding was profuse, but a wound in the artery was identified and obliterated digitally. The tapes were reapplied closer to the lesion.

At this stage it became clear that near the apex of the femoral triangle there was a longitudinal wound on both the anterior and the posterior surface of the femoral artery, each nearly one inch long. The anterior tear opened into the false aneurysmal sac, which had been incised. The posterior tear was adherent to the severely damaged femoral vein and was the site of the arterio-venous fistula. The missile track was seen to pass through the *adductor longus*, and exploration revealed complete division of the *profunda femoris* artery which required ligation.

The repair to both the anterior and posterior walls of the femoral artery was made by direct interrupted sutures of 5/0 "Dermalon" on an atraumatic needle. Closure was in two layers, the inner including all layers without transgressing the intima more than was necessary, and the outer allowing firm apposition of adventitia over the defect. The femoral vein was doubly ligated with stout chromicized catgut above and below the lesion. Repair to the vein was not considered necessary for limb survival and was impossible because of its severe initial injury.

The femoral artery was wrapped in "Oxycel" gauze at the site of repair, after it had been ascertained that the distal segment of artery pulsated. The musculo-fascial layer was repaired over it with chromicized catgut sutures, and the skin was closed with black silk. A small corrugated rubber drain was left in the lower end of the wound for twenty-four hours. The copious dressing was supported by a firm elastic bandage.

Two pints of blood had been given during operation, and on his return to the ward his condition was satisfactory; his blood pressure was 120 millimetres of mercury, systolic, and 80 millimetres, diastolic, and the pulse was detectable at the ankle.

Intravenous therapy played the major part in his post-operative management. Four pints of blood were given by transfusion because the hæmoglobin value was 63% (9·3 grammes *per centum*). Heparin was administered into the tubing of the intravenous apparatus at a rate of 2500 units every four hours, and controlled by estimation of the coagulation time just before each injection. The aim was to keep the coagulation time above ten minutes, and some days 12,000 units were necessary. Heparin therapy was maintained for seven days.

Terramycin was administered by the intravenous route in doses of 100 milligrammes every four hours, because this was found to be the only drug to which the *Ps. pyocyanea* present was not resistant. This drug rapidly causes thrombophlebitis and was discontinued when the patient had been afebrile for two days.

A moderate amount of oozing from the wound persisted for the first five days of heparin therapy. This was readily controlled by the application of wool and a firm bandage, care being taken that this did not obliterate the pulse at the ankle. A small area of slough appeared in the central part of the wound, but was allowed to separate over the following week. The small granulating area was finally healed by pinch grafts.

The patient was not allowed out of bed until the wound was healed, in the sixth week, but active exercises and physiotherapy were commenced in the third post-operative week.

Comment.

The feature of this case most worthy of note is the fact that the femoral artery and vein had sustained such severe damage at the receipt of the initial wound without detection of the damage until two weeks later. Bleeding was at first severe, but had ceased by the time of primary surgical intervention. The femoral vessels were not identified at the time of delayed primary suture, nor was their injury even suspected, because of the small size of the wound. The lesson clearly is that major vascular injury should always be suspected when the patient is suffering so severely from shock as to require blood transfusions after a wound, no matter how trivial this may appear. It is the situation rather than the size of a wound which determines its importance.

The time relation of the appearance of the aneurysmal sac to the removal of the skin sutures poses a question: Was this relation coincidental or casual? There had been some mild wound sepsis, and the time of occurrence is that at which a secondary hæmorrhage may occur; there are many similar features in the pathology of these conditions. On the other hand, the release of tension on division of the skin sutures may have allowed the arterial leakage and false aneurysm formation.

There is little doubt that quadruple ligation of the femoral artery and vein in this case would have severely jeopardized the peripheral circulation in the limb. Destruction of the *profunda femoris* vessels lessened the chances of an adequate collateral circulation. Attempts to maintain major arterial continuity are justifiable when ischæmia or gangrene is likely to follow ligation. Such attempts may be by direct suture of the arterial lacerations when possible, as in this case, or by the insertion of plastic tubing or venous grafts. Direct arterial suture in arterio-venous fistulæ and traumatic aneurysm is often impossible because of the extent of damage to the vessel wall. Thus in the series reported by Schumacker and Carter (1946) of 245 aneurysmal varices, arterial suture was possible in only 33 cases, six of which were not successful.

The writer has recently encountered two cases in which complications have followed primary arterial repair performed in Korea. In one the popliteal artery was found to be completely thrombosed after suture, although the foot was quite normal; apparently temporary patency had allowed of collateral establishment. The second case came dramatically to notice when the writer was called to a massive secondary hæmorrhage from a femoral artery. At operation the hæmorrhage was seen to have come from a sutured laceration in the femoral artery, which was then treated by ligation above and below and by division of the vessel.

The necessity for adequate and controlled administration of heparin after arterial repair increases the hazards of this technique in primary surgery. The patient must be closely observed throughout, and evacuation from the place of forward surgery further increases the risks to limb and life.

Summary.

1. A case of severe vascular injury is reported, in which limb survival is attributed to the maintenance of arterial continuity in a situation in which quadruple ligation is still the generally accepted procedure.

2. An unusual feature was the coexistence of a traumatic aneurysm and an aneurysmal varix.

Acknowledgements.

The writer is proud to record that this soldier was attended during his evacuation by medical officers from Canada, India, America, Great Britain and Australia; this reflects truly the United Nations Forces. The advice and assistance of Lieutenant-Colonel D. Wright, D.S.O., R.A.M.C., was extremely valuable in this case. I am indebted to Major-General F. Kingsley Norris, Director-General of Medical Services, for permission to report this case.

References.

BROWN, J. J. M., BOYD, A. M., LEARMONTH, J. R., and ALBERT, F. (1946), "Discussion on Vascular Injuries in War", *Proc. Roy. Soc. Med.*, 39 : 483.

BROWN, J. J. M. (1948), *Brit. J. Surg.*, War Surg. Supp. Number 2, 354.

HERINGMAN, E. C. (1947), "Choice of Operation for Treatment of Arteriovenous Fistulas", *Surg. Gynec. & Obstet.*, 84 : 903.

SCHUMACKER, H. B., and CARTER, K. L. (1946), "Arteriovenous Fistulas and Arterial Aneurysms in Military Personnel", *Surgery*, 20 : 9.

CANICOLA FEVER IN AUSTRALIA.

By C. N. SINNAMON[1] and V. M. PASK,
Queensland Institute of Medical Research,
AND
D. J. W. SMITH, H. E. BROWN and J. I. TONGE,
Laboratory of Microbiology and Pathology, Brisbane.

IN the course of a study of the fevers of North Queensland made by the Queensland Institute of Medical Research and the Laboratory of Microbiology and Pathology, two human cases of leptospirosis caused by *Leptospira canicola* have been found.

L. canicola has an almost world-wide distribution (Broom, 1951), but so far no cases of canicola fever have been reported in Australia, nor has the organism been identified in the dog in this country (Forbes and Lawrence, 1952). The carrier of *L. canicola* is, as its name implies, the dog, so the disease is regarded as being a domestic rather than an occupational one (Broom, 1951).

Clinical Records.

CASE I.—J.M., aged forty-five years, a general carrier and part-time farmer of Daintree, was admitted to Mossman district hospital in North Queensland at noon on January 19, 1952. He complained of the sudden onset on the evening of January 17 of fever accompanied by shivering, frontal headache and aching joints, particularly the knees. From that time until his admission to hospital the headache continued with increasing severity, his eyes became sore, and he had a slight cough, shivers and frequent profuse sweating. He said that he had been mustering cattle in the rain during the week prior to the onset of the symptoms and had been wet throughout each day. To this fact he ascribed his illness.

[1] Senior Research Fellow, 1951-1952.

On his admission to hospital his temperature was 103° F., his pulse rate was 88 per minute, and his respirations numbered 24 per minute. He was flushed and looked ill. His eyes were suffused and his tongue was coated, and the liver, though not enlarged, was tender on palpation. There was no rash, eschar, jaundice or adenitis, and neither blood nor albumin was detected in the urine. Examination of the chest and central nervous system revealed no abnormality.

The patient was given aureomycin, 500 milligrammes every six hours to a total of four grammes, over the next forty-eight hours, and during this time his condition did not improve and he continued to complain of severe headache. The temperature remained elevated, ranging mainly between 101° and 103° F., the pulse rate being about 80 per minute. Relative bradycardia was a constant feature. On January 21, the fifth day of the illness, aureomycin therapy was stopped and chloramphenicol in a dose of 750 milligrammes was given. This was continued every four hours to a total of six grammes over the next thirty-six hours. During this time the temperature returned to normal, there being a secondary rise to 101° F. at the twenty-eighth hour. From the commencement of chloramphenicol therapy the pulse rate slowed and varied between 54 and 68 per minute. Symptoms subsided with the fall in temperature, and the patient was discharged from hospital on the ninth day of the disease. After his discharge the patient felt weak and ill for about two months and was not fit to follow his usual occupation, although eventually he regained his normal health.

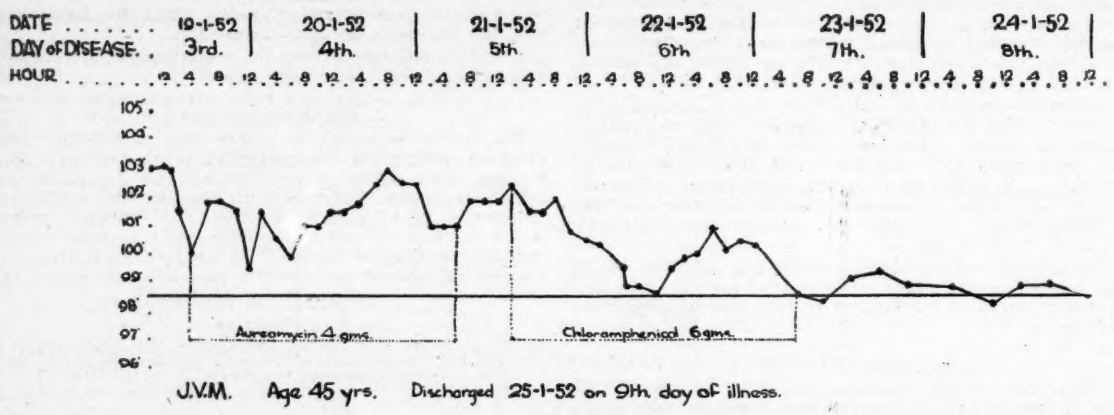

FIGURE I.

On his admission to hospital blood was inoculated into Schüffner's medium, and on the eleventh day of incubation this was found to contain leptospiræ. Serum was collected from the patient on the nineteenth, twenty-sixth and fifty-third days since the onset of the disease. The culture and sera were forwarded to the Laboratory of Microbiology and Pathology, Brisbane, for examination.

CASE II.—J.B., a schoolboy, aged seven years, was admitted to Babinda hospital, North Queensland, on January 21, 1952. He complained of the sudden onset of headache and fever, which had occurred two days previously. On examination of the patient, his temperature was 103·6° F., his eyes were suffused, his liver was tender and palpable, and left inguinal adenitis was present. No rash, jaundice or eschar was noticed, and no albumin was found in the urine. He was treated with reduction sponges, aspirin, and sulphadiazine in a dosage of 0·25 gramme every four hours to a total of four grammes. The temperature rose to 104·8° F., fell to 99° F., and rose again to 105·4° F. on the day following his admission to hospital. Blood was collected for serological investigation and inoculation into Schüffner's medium. Penicillin was substituted for sulphadiazine and given in a dosage of 50,000 units every three hours to a total of 3,200,000 units over the next eight days. The temperature fell to normal eighteen hours after the commencement of penicillin therapy, but there was a secondary rise in temperature with recurrence of mild symptoms on the third, fourth and fifth days of treatment. The patient was discharged from hospital on the fourteenth day of the illness, apparently quite well, although he was somewhat listless and slight

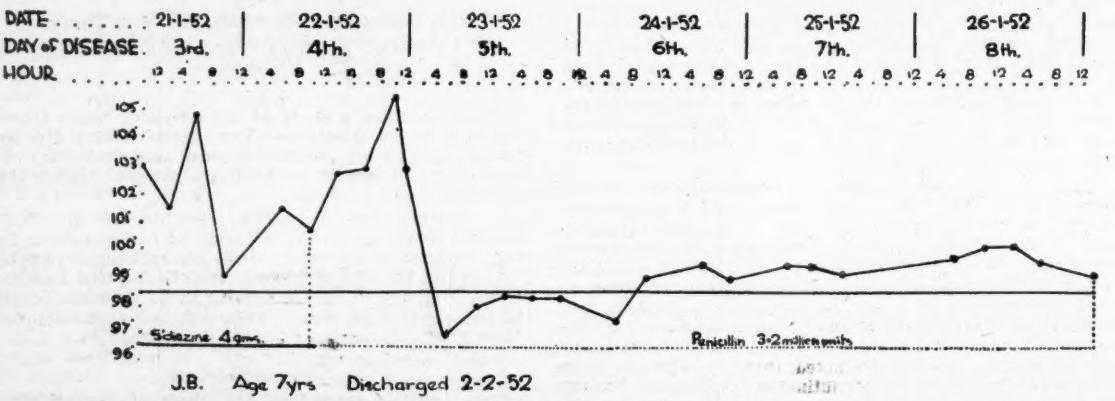

FIGURE II.

liver tenderness remained. Subsequently complete recovery occurred.

The Schüffner culture was found to contain leptospiræ when examined on the ninth day of incubation. Blood was collected on the fourth, twenty-fourth, fifty-second and 209th days after the onset of the disease.

Laboratory Investigations.

The results of the laboratory investigations are set out in Tables I, II, III and IV. In Table I are the results of the agglutination tests with the patients' sera, collected

TABLE I.
Agglutinating Titres of Patients' Sera against Type Cultures.[1]

Type Cultures.	Case I: Day of Disease.			Case II: Day of Disease.			
	19	26	53	4	24	52	209
L. icterohæmorrhagiæ ..	100	100	300	0	0	0	0
L. canicola	1000	1000	300	0	300	30	30
L. australis A	0	0	0	0	0	0	0
L. australis B	0	0	0	0	0	0	0
L. pomona	0	0	0	0	0	0	0
L. mitis	0	0	0	0	0	0	0
"Ives" strain[2]	0	0	0	0	0	0	0
"Celledoni" strain[2] ..	0	0	0	0	0	0	0
"Robinson" strain[2] ..	100	100	300	0	100	100	100
Patient's own culture	1000	1000	300	0	300	100	100

[1] The figures shown are the reciprocal of the titres; "0" = negative result in dilutions of 1 : 10 and upwards.

[2] These strains have been isolated in North Queensland during the course of the present investigations, but as yet have not been fully investigated or identified.

at different times in the course of the disease, against type cultures of leptospiræ. Living culture antigens were used for all agglutination tests. It will be observed that in each case the patient's serum agglutinated in similar titre, *L. canicola* and his own culture. In Case I cross-agglutination occurred with both *L. icterohæmorrhagiæ* and the "Robinson" strain, whereas in Case II "crossing" occurred only with the "Robinson" strain.

Table II shows the reactions of the cultures obtained from both patients with type antisera which had previously been prepared in rabbits with our stock laboratory strains

TABLE II.
Titres of Type Antisera against Case I and Case II Cultures.

Type Antisera.	Titre Against Case I Culture.	Titre Against Case II Culture.
L. icterohæmorrhagiæ (titre 1 : 3000) ..	0[1]	0
L. canicola (titre 1 : 10,000)	10,000	10,000
L. australis A (titre 1 : 3000)	0	0
L. australis B (titre 1 : 3000)	0	0
L. pomona (titre 1 : 10,000)	0	0
L. mitis (titre 1 : 10,000)	0	0
"Ives" strain (titre 1 : 10,000)	0	0
"Celledoni" strain (titre 1 : 10,000) ..	0	0
"Robinson" strain (titre 1 : 3000) ..	100	300

[1] "0" = Negative result in a dilution of 1 : 10 and upwards.

of leptospiræ. It will be noted that in both cases the patient's cultures were agglutinated to the full titre of the *L. canicola* type antiserum. They did not react with any other antiserum except "Robinson", and then only in low titre.

Antisera were prepared in rabbits from the cultures from both patients, and these were tested against the type cultures maintained in the laboratory. The results are set out in Table III.

From these and the preceding results it was apparent that the leptospiral strain obtained from the two patients was either identical with or very closely related to *L. canicola*, but it was decided to forward both the cultures and the antisera to London for final identification.

Dr. J. C. Broom, of the Wellcome Laboratories of Tropical Medicine, London, kindly carried out absorption tests on the antisera for us, and to him we are greatly indebted. His results are set out in Table IV, and in his letter he stated that, in his opinion, the patients were indeed infected with *L. canicola*.

Epidemiology.

It is a curious coincidence that both patients became ill on almost the same day although they had no association with each other, living as they did over one hundred miles apart.

The first patient's farm consisted of dense forest flats on the banks of the Daintree River. The farm was used for fattening cattle, and no sugar cane or other crops were grown. Several horses were kept on the farm.

TABLE III.
Titre of Case I and Case II Antisera against Type Cultures.

Type Cultures.	Case I Antiserum (Titre 1 : 1000).	Case II Antiserum (Titre 1 : 10,000).
L. icterohæmorrhagiæ ..	0[1]	100
L. canicola	1000	3000
L. australis A	0	0
L. australis B	0	0
L. pomona	0	0
L. mitis	0	0
"Ives" strain	0	0
"Celledoni" strain ..	0	0
"Robinson" strain ..	10	10

[1] "0" = Negative result in a dilution of 1 : 10 and upwards.

The second patient lived on the edge of heavy jungle on the outskirts of the town of Babinda, with a small mountain creek covered with undergrowth running alongside the house. The child's father was a labourer in the Babinda sugar mill. Forty-five inches of rain had fallen in the two weeks prior to the onset of his illness. Bandicoots and rodents were plentiful in the areas where both patients lived.

As soon as it became apparent that these patients were probably suffering from canicola fever, an investigation was made to determine what contact they had had with dogs. It was found that each had a dog which he was in the habit of fondling.

The dog belonging to the first patient had been ill on two occasions, six weeks and four weeks prior to the onset of its owner's illness. The dog, a puppy aged about two

TABLE IV
Results of Absorption Tests.[1]

Antiserum.	Titre Against *L. Icterohæmorrhagiæ.*	Titre Against *L. Canicola.*
Case I:		
Unabsorbed	30	1000
Absorbed with *L. icterohæmorrhagiæ*	0[2]	1000
Absorbed with *L. canicola*	0	0
Case II:		
Unabsorbed	100	1000
Absorbed with *L. icterohæmorrhagiæ*	0	1000
Absorbed with *L. canicola*	0	0

[1] Formalinized antigens were used by Dr. Broom for the absorption tests

[2] "0" = Negative result in dilutions of 1 : 30 and upwards.

months, had been taken by the patient out to his farm in hot humid weather, and whilst following him through long grass became overheated and "took a fit". The dog recovered when taken to a cool place, but the same thing occurred two weeks later under similar conditions. Unfortunately the puppy was killed accidentally before serum could be obtained. Serum obtained from a dog in the same litter gave no reaction with leptospiral agglutination tests.

Serum was collected from two dogs on neighbouring farms, and in both there was undoubted evidence of leptospiral infection, titres of 1:100 being obtained with

L. australis A. In one instance there was no reaction with *L. canicola*, whilst in the other a titre of 1:10 was obtained with this organism—a titre we are accustomed to regard as being of little significance.

No history of illness was obtained for the dog belonging to the second patient, but it was probable that the patient, a child, aged seven years, lived in close association with it. The dog was described as being "a good ratter", and frequently brought home various rodents from the surrounding scrub land. Serum was obtained from this dog, but no reaction was found to occur with the leptospiral agglutination test.

Discussion.

There is no doubt that these two patients were suffering from leptospirosis due to *L. canicola*, and this is the first known occurrence of infection with this organism in Australia. It is unfortunate that the source of infection was not determined in either case.

To date *L. canicola* has not been found in dogs in Australia, but the surveys of dogs that have been carried out have been strictly limited. In the course of our investigations in North Queensland only seven dogs have been examined, and it is obvious that no conclusions can be drawn from this number. Of the seven dogs examined four showed evidence of infection with leptospirosis, but only one gave any reaction with *L. canicola* and that in an insignificant titre. However, the interpretation of leptospiral agglutination titres in single specimens of serum frequently leads to false conclusions as to the infecting type of organism.

It is desirable that an extensive survey be made of dogs in North Queensland as well as of rodents, bandicoots and other native animals to study the epidemiology of canicola fever as it occurs there.

Besides the two patients here described, three others have provided suggestive serum agglutinations with *L. canicola*. These may also have been suffering from canicola fever; but as the diagnosis of leptospiral type from agglutination tests is sometimes uncertain, we hesitate to designate them as such.

Summary.

Two human cases of leptospirosis caused by *L. canicola* in North Queensland are described. In each case the organism was isolated in culture. This is the first report of canicola fever in Australia.

Details are given of the laboratory investigations.

L. canicola has not been found in dogs in Australia, but surveys have been very limited and further work is necessary.

Acknowledgements.

Special thanks are due to Dr. J. C. Broom, of the Wellcome Laboratories of Tropical Medicine, for carrying out the absorption tests. Thanks are due to Dr. Douglas Hodges, of Mossman, and Dr. Robert Hay, of Babinda, who first examined these patients and admitted them to hospital. We are indebted to Dr. E. H. Derrick for his help in preparing this paper.

References.

BROOM, J. C. (1951), "Leptospirosis in England and Wales", *Brit. M. J.*, 2: 689.

FORBES, B. R. V., and LAWRENCE, J. J. (1952), "Canicola Fever", M. J. AUSTRALIA, 1: 23.

Addendum.

Since this paper was submitted for publication organisms which are serologically identical with *L. canicola* have been isolated from three patients by Miss C. J. Ross, of the Field Station of the Queensland Institute of Medical Research. These cultures were submitted to the Laboratory of Microbiology and Pathology for identification.

One patient was a schoolboy, aged sixteen years, and the second a cane farmer, aged forty years; both came from Gordonvale in North Queensland. The other patient was a housewife, aged forty-seven years, from Babinda, and it is of interest that she lives close to the patient J.B., mentioned in the foregoing paper, but the onset of her illness was almost one year later.

Books Received.

[The mention of a book in this column does not imply that no review will appear in a subsequent issue.]

"Problems of Infancy and Childhood: Transactions of the Sixth Conference, March 17 and 18, 1952, New York", edited by Milton J. E. Senn, M.D.; 1953. New York: Josiah Macy Junior Foundation. 9" × 6¼", pp. 160, with one text figure. Price: $2.50.

Chief among the subjects are emotional development in the first year of life and observation of individual tendencies in that period.

"A Guide to Obstetrics in General Practice", by William C. W. Nixon, M.D. (London), F.R.C.S. (England), F.R.C.O.G., and Eric B. Hickson, M.R.C.S., L.R.C.P., D.(Obst.), R.C.O.G.; 1953. London: Staples Press, Limited. 8½" × 6", pp. 302, with 35 illustrations. Price: 30s.

The object of the book is implicit in its title.

"Modern Trends in Forensic Medicine", edited by Keith Simpson, M.D. (Path.), London; 1953. London: Butterworth and Company (Publishers), Limited. Sydney: Butterworth and Company (Australia), Limited. 10" × 7", pp. 336, with 133 illustrations and two plates in colour. Price: 82s. 6d.

The intention is to review the last ten years' experience in the subject.

"Physical and Emotional Aspects of Marriage", by C. L. Anderson, Dr.P.H.; 1953. St. Louis: The C. V. Mosby Company. Melbourne: W. Ramsay (Surgical), Limited. 9" × 6", pp. 234, with 14 illustrations. Price: £2 2s.

The author has tried to put into book form answers given to questions put to him by people of college age.

"Direct Analysis: Selected Papers", by John N. Rosen, M.D.; 1953. New York: Grune and Stratton, Incorporated. 9" × 5½", pp. 192. Price: $3.75.

Deals with nine different aspects of psychoanalysis.

"Polyglot Medical Questionnaire: In Twelve Languages with Digital System of Communication", by S. Chalmers Parry, M.A. (Cantab.), M.R.C.S., L.R.C.P., D.P.H., with a foreword by M. T. Morgan, C.M.G., M.D., D.P.H.; 1953. London: H. K. Lewis and Company, Limited. 5" × 7½", pp. 62. Price: 28s. 6d.

To help the practitioner break down the barrier of language when dealing with foreign patients.

"Modern Treatment: A Guide for General Practice", by fifty-three authors, edited by Austin Smith, M.D., and Paul L. Wermer, M.D.; 1953. New York: Paul B. Hoeber, Incorporated. 10½" × 7½", pp. 1162, with 13 text figures. Price: $20.00.

The book "is designed to provide the general practitioner with a useful and authoritative guide to the clinical problems in therapy which he is likely to encounter".

"The 1952 Year Book of Orthopedics and Traumatic Surgery (November, 1951-November, 1952)", edited by Edward L. Compere, M.D., F.A.C.S.; 1953. Chicago: The Year Book Publishers, Incorporated. 8" × 5¾", pp. 388, with 226 illustrations. Price: $6.00.

One of the Practical Medicine Series of Year Books.

"Bodily Physiology in Mental and Emotional Disorders", by Mark D. Altschule, M.D.; 1953. New York: Grune and Stratton. 9" × 6", pp. 236. Price: $5.75.

Intended primarily for internists and students.

"Gifford's Textbook of Ophthalmology", by Francis Heed Adler, M.D.; Fifth Edition; 1953. Philadelphia and London: W. B. Saunders Company. Melbourne: W. Ramsay (Surgical), Limited. 9½" × 6¾", pp. 498, with 26 plates in colour and 281 text figures. Price: £3 11s. 3d.

The first edition was published in 1938 and the fourth in 1947.

The Medical Journal of Australia

SATURDAY, JUNE 20, 1953.

All articles submitted for publication in this journal should be typed with double or treble spacing. Carbon copies should not be sent. Authors are requested to avoid the use of abbreviations and not to underline either words or phrases.

References to articles and books should be carefully checked. In a reference the following information should be given without abbreviation: surname of author, initials of author, year, full title of article, name of journal without abbreviation, volume, number of first page of the article. If a reference is made to an abstract of a paper, the name of the original journal, together with that of the journal in which the abstract has appeared, should be given with full date in each instance

Authors who are not accustomed to preparing drawings or photographic prints for reproduction are invited to seek the advice of the Editor.

FLIGHT ABOVE THE ATMOSPHERE.

AN aspect of aviation medicine that has become increasingly important in recent years relates to flight above the atmosphere. A record height was achieved in August, 1951, by William Bridgeman in the Douglas D-558-2 Skyrocket. The exact altitude was not reported publicly, but according to Colonel Paul A. Campbell,[1] of the Medical Corps of the United States Air Force, it was admitted to have been above the former balloon record of 72,395 feet, held by Stevens and Anderson—that is, between 13 and 14 miles. Campbell states that this record is significant if one realizes that at the admitted altitude Bridgeman was above at least 95% of the substance of atmosphere or, stated in another way, the penetration of 5% more of its substance would have placed him in space; however, the actual remaining distance was great. An unmanned two-stage rocket, in its second stage, has reached an altitude of approximately 250 miles; this means that, from a practical functional viewpoint, it was, at the peak of its journey, in space, as the mean free path of the remaining particles of air at that altitude was in the neighbourhood of from two to four miles. This condition represents a more complete vacuum than has been created in the laboratories. It appears that with the development of the rocket principle of propulsion man may soon be able to travel above the atmosphere, and consequently to approach frictionless travel. Campbell states that most of the major problems of such flight differ from those of present-day high altitude flight only in degree, and that none appear insurmountable with the possible exception of that of cosmic rays. The problems fall into three categories: first, those resulting from rapid penetration of the atmosphere both on the outward journey and on the return; second, those that result from the loss of life-sustaining qualities of the atmosphere; third, the loss of protection afforded by the filtration qualities of the atmosphere. The density of the atmosphere decreases rapidly as altitude is gained. About 90% of the mass of the atmosphere lies within ten miles above the earth, while almost 99% of it lies within twenty miles. The remaining 1% extends to 6000 or, possibly, as far as 60,000 miles. Ambient temperature decreases as altitude is gained, the decrease averaging about 1° F. per 300 feet of ascent till an altitude of about seven miles is reached. Above this the temperature remains relatively constant at −67° F. to about 20 miles, when it again begins to rise, reaching approximately 170° F. at 31 miles. It remains constant for the next seven miles, begins to drop at 38 miles, and reaches −27° F. at 50 miles, when it again remains constant for a few miles. At this level the atmosphere is so rarefied that heat can no longer be transferred to it; consequently the temperature of an object is that of heat transferred by solar radiation, and depends upon the absorptive or reflective characteristics of the object. Temperatures may reach extremes, depending upon the characteristics of the exposed surfaces. Sky brightness decreases with gains in altitude. The sky is as dark as night above an altitude of 70 to 80 miles, but every reflecting object acts as a new light source to reflect the light of the sun. The ozone concentration varies with gains in altitude, the maximum concentration occurring between 11 and 20 miles. From a functional point of view, space apparently begins at about 120 miles of altitude. Travel is then practically frictionless. The first group of problems, those relating to rapid penetration of the atmosphere, result from the high degrees of acceleration and tremendous velocities associated with rocket propulsion. In addition, return to earth requires rapid deceleration. High temperatures of the aircraft result from high velocity flight, but apparently the engineering problems of cooling thus presented, although serious, are not insoluble. The capacity of human passengers to tolerate the high velocities and rapid deceleration presents a different kind of problem. However, experiments so far indicate that if a suitable position is adopted by the passengers, sufficient acceleration and deceleration for extensive rocket flights should be tolerable. Problems resulting from the loss of the life-sustaining qualities of the atmosphere relate not only to the atmospheric substance, but also to atmospheric pressure. Without both of these human life would be impossible. The importance of the atmospheric substance, particularly oxygen, is obvious. The pressure of our atmosphere makes possible the oxygenation of our blood and affords necessary restraint of our cellular structure. If at sea level all atmospheric pressure was suddenly removed, our tissue fluids would almost instantly boil and some of our cellular structures would rupture. This means that at least a portion of the atmosphere to which we are accustomed must be carried along as an artificial environment in a completely sealed cabin. The third group of problems relates to the loss of protection afforded by the filtration qualities of the atmosphere. Campbell states that this quality of filtration protects us from the more destructive portions of the ultra-violet spectrum and the undesirable portions of the infra-red spectrum, from practically all the primary particles of cosmic radiation, and from meteors and meteoritic dust. Danger from ultra-violet and infra-red radiation can be overcome by suitable construction of the aircraft, but shielding against cosmic radiation is quite a different matter. Cosmic rays appear to be ultra-high-speed particles arising from undetermined extraterrestrial sources. They possess energy in excess of billions of electron volts, and at least some of the particles are capable of producing nuclear disintegration. The earth is protected from them by atmospheric filtration, but Campbell states that the few

[1] *J.A.M.A.*, September 6, 1952.

cosmic rays that strike the surface of the earth are of sufficient velocity to penetrate several hundred feet into it. At an altitude of 23 miles the mass of the atmosphere becomes a virtually ineffective shield against these particles. As adequate shielding by suitable construction of the aircraft may require prohibitive weight, there is considerable evidence that cosmic rays may produce a barrier sufficient to prevent operation above this altitude. Another hazard is presented by meteors, meteorites, or grains of meteoritic dust. The last-mentioned are fragments, usually of stone or iron, and of very small size, which travel at tremendous velocities; impact velocities of from six to 45 miles per second have been observed. It has been estimated that the statistical probability of space vehicular puncture is in the neighbourhood of twice per month of operation, depending, of course, on the size of the vehicle. Campbell states that the engineering problems involved in cabin pressurization and the provision in the cabin of an atmosphere that not only is initially suitable but can be washed and recirculated are not insurmountable. However, penetration of such a cabin by a meteoritic fragment, or the loss of a door or window, would present a very serious hazard through explosive decompression. Unless the perforation was quite small and immediately plugged, consciousness could be sustained for only about fifteen seconds. Pressure suits are thought likely to offer some protection against minor perforation, and it has been suggested that structural protection could be afforded by a laminated cabin shell with air spaces and self-sealing material between the laminations.

There are obviously many other problems associated with this flight into virtual space that offer a challenge, probably a fascinating challenge, to the construction engineer. Whether or not we ever travel in space remains, in Campbell's view, a question for future answer. The situation is paradoxical, for as our knowledge increases many new problems will constantly present themselves. Campbell makes no attempt to deal with the psychological problems that may present themselves; but although these might have seemed formidable to a past generation, they are not likely to daunt the air-minded present generation, and probably will be dismissed lightly by the space-minded generation of the immediate future.

Current Comment.

DIAGNOSTIC FEATURES OF IDIOPATHIC STEATORRHŒA.

THE term idiopathic steatorrhœa is not particularly satisfactory, as it merely implies the presence of one particular symptom of unknown cause. However, the term has come to be applied to a fairly definite clinical syndrome and seems preferable to the alternative designation, non-tropical sprue. According to W. T. Cooke, A. L. P. Peeney and C. F. Hawkins,[1] idiopathic steatorrhœa is characterized by mild chronic ill health, recurrent glossitis, anæmia and variable degrees of intestinal upset. There is a significant familial incidence. Diagnostic criteria include abnormal fat absorption, as demonstrated by fat balance techniques, disturbances of the hæmatopoietic system, and a deficiency pattern found on X-ray examination of the intestinal tract. This brief summary of the condition and its characteristics is based on a study of 100 patients selected from a series of more than 300 suffering from steatorrhœa, and the report is worthy of careful examination. The detailed analysis of the symptoms is most illuminating, but we can mention only a few outstanding points. One of three main groups of symptoms caused patients to seek medical advice in this series: constitutional disturbances, such as lassitude, loss of weight, glossitis and symptoms of anæmia (44 patients); diarrhœa (43 patients); miscellaneous symptoms, such as neurological effects, severe tetany, severe backache, fractured neck of the femur and, particularly, gastric symptoms suggesting ulceration (13 patients). It should be noted that this grouping refers only to presenting symptoms; certain of the symptoms listed were much more common, although they were not always the cause of the patient's seeking medical advice. Nearly all patients complained of lassitude and loss of weight. All but 20 patients suffered a disturbance of bowel habits. A common feature was attacks of loose stools or actual watery diarrhœa lasting for a few days three or four times a year. The stools were usually paler than normal, in most cases offensive, and sometimes frothy; occasionally the colour was normal. In other cases the diarrhœa was persistent and of many years' duration. Conditions of mental or physical strain often precipitated attacks of diarrhœa. Rest in bed usually produced a rapid cessation of diarrhœa, and sometimes even constipation. Study of their food habits had enabled some patients to keep their diarrhœa under control. Between attacks more than 70 patients had normal bowel habits and passed stools of normal colour and consistency once or twice a day. Attention is drawn to the fact that 20 patients, or one in five, at no time had any diarrhœa. The fact is also emphasized that pale stools may occur in diarrhœal conditions if there is no steatorrhœa, and that frequently stools containing an excess of fat may be of normal colour and consistency.

Abdominal symptoms were usually mild and often elicited only by direct questioning; they included flatulence, flatus, nausea during attacks of loose motions, and vomiting. It is important to note that two patients had acute attacks closely simulating acute intestinal obstruction; in one case laparotomy produced a diagnosis of partial volvulus secondary to gaseous distension of the colon, and in the other the severe abdominal pains ceased with the correction of hypokalæmia. Appetite was as a rule good, and sometimes excessive. Cramps were usual; tetany occurred but was less common. Hæmorrhagic disorders included purpura in 10 cases, and severe hæmaturia and hæmorrhage from the bowel each in one case. The occurrence of mental symptoms appears to have been less than in some previously reported series. Glossitis was present at some time in 90 of the 100 cases of this series, and in about one-third the symptoms were severe. Hypokalæmia was an important effect; the authors state that recognition of the importance of potassium therapy enabled them to restore to full working life a few patients whom, from their previous experience, they would have adjudged too severely ill to recover. In a considerable number of cases the disorder could be traced in some form back to childhood. The evidence for familial occurrence was limited but strong. In some cases a characteristic physiognomy was evident: a rather plump, round face with prominent zygomatic arches in women, and a triangular appearance of the face from the front in men. Premature greying of the hair was common, and the hair was always of fine texture. Ten patients had generalized pigmentation closely resembling Addison's disease, and a further 32 had pigmentation of the extensor surfaces of the arm, neck and face with a contrasting pallor of the palms. Ten patients had a desquamating rash affecting the hands, legs and forearms, and occasionally the face. Reversible clubbing of the fingers occurred in 17 cases and koilonychia in seven. Pyrexia was common, but usually mild. Œdema was frequently seen when the general condition was poor, but in the group as a whole no correlation was found between the œdema and the level of the serum proteins. Low blood pressure was usual. Many patients had a doughy abdomen. The liver was not enlarged, but mild splenomegaly occurred in 11 cases. Lesions of the central nervous system were rare. Radiological evidence of decalcification was common,

[1] *Quart. J. Med.*, January, 1953.

but in only a few cases were there clinical effects. Earlier patients in the series did not undergo radiological examination of the intestinal tract, but 75 were examined with a flocculating barium emulsion and all showed varying degrees of what is described as a "deficiency pattern". Hæmatological investigation revealed that, at first examination, two-thirds of the patients had macrocytosis, usually associated with an increased mean cell volume. Microcytosis was very rare. Of the patients with obvious macrocytosis a small number had a peripheral blood picture indistinguishable from that of pernicious anæmia. However, the usual appearances in the stained films were a moderate degree of anisocytosis with conspicuously little poikilocytosis and occasional target cells. In all cases in which the sternal marrow was examined some degree of erythroid hyperplasia was found. Severe anæmia was not common. Fæcal examination, by means of balance tests, revealed a mean fat absorption on initial examination of 74·8 ± 12·25% with a range of 30% to 89% and a median of 80·5%. Microscopic examination of the fæces showed an excess of fatty acid crystals in 85 cases. Examination of the plasma failed to show any features diagnostic of steatorrhœa.

Cooke, Peeney and Hawkins consider that their group of 100 patients presents a clinical picture which is sufficiently homogeneous and sufficiently distinct from that of steatorrhœa due to demonstrable causes to be regarded as idiopathic in type. They point out that in the early part of their study the only criterion of diagnosis adopted was the presence of steatorrhœa in the absence of a demonstrable ætiological factor. For this investigation the only conclusive method available at present is in the form of fat balance studies. However, in making a diagnosis of idiopathic steatorrhœa, other criteria are important, as is made clear. Two-thirds of the patients in this series had macrocytosis when their blood was first examined, and the remainder developed an increased mean cell volume at some time. Consequently, consistently normal blood values are regarded as strong evidence against the diagnosis of idiopathic steatorrhœa. On the other hand, normochromic macrocytic anæmia in which poikilocytosis is not conspicuous, or even hypochromic anæmia with considerable variation in depth of cell-staining, is considered extremely suggestive of the presence of idiopathic steatorrhœa. These investigators also regard radiological examination of the intestinal tract as an essential diagnostic procedure and consider the presence of a "deficiency pattern" produced with a flocculating barium emulsion as one of the diagnostic criteria of the disease. The opinion is expressed here that if it is not possible to perform a fat balance test, the demonstration of a "deficiency pattern", together with suggestive symptoms such as those which have been referred to, an abnormal blood picture and an excess of fatty acid crystals in the fæces, makes the diagnosis of idiopathic steatorrhœa almost certain. The experience of Cooke, Peeney and Hawkins in their clinic has led them to believe that idiopathic steatorrhœa presents a clinical picture which is easily recognizable when one is alert to it. They would certainly appear to be alert to it themselves, and their careful published study should help to stimulate a corresponding alertness in others. The diagnosis is of much more than academic interest, as, in some cases at least, striking effects appear to have been obtained from specific treatment. There seems to be sound justification for the concluding dictum that patients with atypical anæmia or chronic diarrhœa cannot be considered as having been fully investigated unless a fat absorption test has been performed.

THE HÆMATOLOGICAL EFFECTS OF CHLORAMPHENICOL.

THE clinical career of chloramphenicol ("Chloromycetin") has some features which resemble those of many drugs introduced into medical practice. At first hailed as a non-toxic antibiotic, and used over a wide range of infective states, it was later found to be the occasional cause of toxic effects on the hæmopoietic system. Whether these effects are sufficiently common and severe to warrant the discontinuance of its use on a wide scale is an important matter, and a recent brief article on the subject by Allan Erslev suggests that such drastic steps are unnecessary.[1]

Apart from possible depression of the functions of the bone marrow few unpleasant side effects have been observed. These have been of two kinds, a usually mild degree of gastro-intestinal disturbance, which is no greater in intensity than that observed after the administration of many useful drugs, and symptoms considered to be due to avitaminosis. The latter have been a subject of interest for some years, since the introduction of the sulphonamides and the antibiotics, and can be largely countered by appropriate dosage of appropriate vitamins. After all, the fully correct technique of using a powerful and valuable therapeutic agent is likely to become one of those arts of medical treatment which may be acquired only by intensive effort and study, both individual and general. Erslev's article deals with two cases only, of which he gives the case histories, but these illustrate the value of a cautious approach to the method of use of "Chloromycetin". Both the patients described were elderly; one suffered from typhoid fever and the other from a Salmonella infection complicating hæmochromatosis. In each instance treatment was prolonged; in one 155 grammes of "Chloromycetin" were given in fifty days, and in the other 66 grammes in twenty-four days. Anæmia and hypoplasia of the bone marrow were observed, and the significance of a gradual decrease in the circulating neutrophile leucocytes was not at first realized as being due to depression of bone marrow function. Examination of the bone marrow showed myeloid maturation arrest and hypoplasia of the erythrocyte series. It is easy to see how the presence of a leucopenia might not arouse any particular anxiety at first in infections of this type. Fortunately the hæmopoietic depression was reversible; the numbers of circulating leucocytes rose as soon as the drug was discontinued. This is, of course, not proof of the ætiological relationship of the "Chloromycetin", but the author points out that this difficulty may be seen in the assessment of many of the reported cases. He further comments that after the drug was first introduced its structure suggested the possibility of toxicity affecting blood formation, but states that 40 cases have been so far reported in which maturation, arrest or hypoplasia of the marrow has been sequentially related to the administration of "Chloromycetin". These changes have been reversible in some instances, but 27 deaths have been recorded. Erslev quotes other authors who have found evidence of bone marrow changes in patients who have shown no suggestive symptoms, but in whom special marrow examinations were carried out. He concludes that more critical and frequent hæmatological studies are desirable where the chosen treatment includes the more or less prolonged use of a substance suspected to require this particular kind of care.

A survey of a much wider kind has recently been made in a symposium dealing with the use of antibiotic and chemotherapeutic agents in the treatment of diseases of various systems.[2] In this opinions differ about "Chloromycetin". M. J. Romansky and G. A. Kelser think that it should not be used in infections of the respiratory system until questions of its toxicity are cleared up. J. D. Hughes regards "Chloromycetin" as the drug of choice for typhoid fever, and advises adequate dosage for at least twelve days; he gives a scheme of dosage which is recommended.[2] Substitution of another antibiotic is always possible, but even with the wide range of antibiotics now available to us this cannot always be done with equal degrees of benefit. The history of therapeutics does not suggest that the medical profession has been too timid to use sharp weapons in the interest of patients with serious maladies; nevertheless, care may not only add to the safety of the patient, but also extend the range of powerful drugs at our disposal.

[1] *Blood*, February, 1953.
[2] *J.A.M.A.*, December 13, 1952.

Abstracts from Medical Literature.

PHYSIOLOGY.

Nitrogen Metabolism After Whole Body Irradiation.

G. E. GUSTAFSON AND S. KOLETSKY (*Am. J. Physiol.*, November, 1952) state that rats which die after whole body irradiation show a considerable initial and terminal loss in weight, little food being consumed during these periods. They report that for the first six days after whole body irradiation with 660*r* rats are in considerable negative nitrogen balance. This cannot be accounted for on the basis of decreased food intake alone. Additional factors are tissue destruction and probably alteration in metabolism due to irradiation. A second period of negative nitrogen balance may occur in irradiated rats during the second or third week after irradiation. Here blood loss or infection may be contributing factors. Water intake in the rats irradiated with 660*r* decreased greatly on the second and third days after irradiation, while the intake of the control rats increased greatly. Urinary output in both groups followed the same trend as the water intake. For the first three days after whole body irradiation, rats which received 660*r* showed greater nitrogen excretion and more negative nitrogen balance than did animals which received 1000*r*.

Temperature and the Transfer of Serum Proteins into Injured Tissues.

D. H. MOORE AND D. L. WORF (*Am. J. Physiol.*, September, 1952) report that buffered saline extracts and subcutaneous exudates obtained from injured limbs treated by cooling with ice have been compared with those from the limbs of the same animal similarly injured but untreated. Injuries were produced on deeply anæsthetized animals either by tourniquet or by scalding. Cooling during the latter three-fourths of the tourniquet period or immediately after scalding prevents œdema from developing and also inhibits the exchange of blood and tissue substances. After tourniquet injury a weighed quantity of muscle from the limb treated by cooling yielded less extract, with a lower albumin and total protein concentration, than did an equal weight of injured but untreated muscle. After burn injury limbs treated by cooling yielded from one-third to one-tenth (or less) as much exudate as did contralateral injured but untreated limbs. The exudates from the cooled limbs had a lower protein concentration than did the controls. Cooling after burns reduced both the quantity and concentration of extracts obtained from muscle and skin.

Intestine in Reflex Chemical Control of Breathing.

J. W. BEAN (*Am. J. Physiol.*, December, 1952) reports that in dogs anæsthetized with "Pentothal Sodium" occlusion of the artery and vein of intestinal loops, completely isolated except for the extrinsic nerves, induced transient augmentation of breathing. Administration of sodium cyanide to the peritoneal surface of a loop during the maintenance of the vascular occlusion resulted in a small initial depression of breathing followed by a pronounced augmentation. The reversal of these effects was hastened by rinsing the tissue in Tyrode's solution. Release of the vessels resulted in another increase in breathing, which was attributed to the release of cyanide, the accumulated metabolites and possibly unknown substances from the intestinal loop into the general circulation. The author states that the receptors involved are activated by chemical changes occurring in the tissues as a result of disturbances in blood flow, by chemical alterations in the blood itself and by chemical changes in the intraperitoneal space acting directly on peritoneal surfaces. These respiratory reactions, which were demonstrated to be of reflex origin, serve to supplement other mechanisms in respiratory regulation.

Effect of Low Temperatures on Isolated Arteries.

D. J. SMITH (*Am. J. Physiol.*, December, 1952) reports the effect of cooling and of low temperatures upon the reactions of isolated surviving swine and dog femoral and carotid arteries. Cooling at 4° C. to 6° C. per minute produces significant (up to 35%) vasoconstriction of swine carotid arteries. The flow through the *vasa vasorum* is decreased by low temperatures. This is the result not only of an increase in the viscosity of the perfusate but also of constriction of the *vasa vasorum*. The possible role of this observation in the pathological changes of immersion foot is mentioned. Prolongation of 400% to 600% in the reaction time to epinephrine, acetylcholine and histamine at 17° C. is due to slower constriction as well as recovery. One normal human artery, a bronchial artery, showed changes in its reactivity with cold closely comparable to the above. Caution is urged in applying these results *in vivo*. Possible relationships of these results to the Hunting reaction and the decreased capacity of the cooled finger are noted.

Inhibition of Gastric Acid Secretion by Carbonic Anhydrase Inhibitor.

H. D. JANOWITZ, H. COLCHER AND F. HOLLANDER (*Am. J. Physiol.*, November, 1952) state that since the discovery of Davenport that the parietal cells of the gastric mucosa have a high concentration of carbonic anhydrase, a role has been sought for this enzyme in the process of hydrochloric acid secretion. They report that secretion of hydrochloric acid by dogs with Heidenhain (fundic) pouches in response to repeated subcutaneous injection of histamine was greatly inhibited by the intravenous injection of 2-acetylamino-1,3,4-thiadiazole-5-sulphonamide (compound number 6063), a new and powerful inhibitor of carbonic anhydrase. Inhibition of acid secretion was manifested by a decrease in volume rate of secretion of juice and in concentration of acid, twenty to eighty minutes after injection of the inhibitor, and persisted for at least three to six hours. Apparently complete recovery was present twenty-four hours later. In 18 experiments on three dogs, between 70% and 97% (mean, 85%) of the output of hydrochloric acid was inhibited by compound number 6063 in doses of five to 120 milligrammes per kilogram. The degree of inhibition was not increased by increasing the dosage within this range. Doses of five and ten milligrammes per kilogram were effective in only one of three animals. In the range five to 60 milligrammes per kilogram, the drug was tolerated well; but one of five dogs expired in respiratory arrest after 120 milligrammes per kilogram. These experiments support the concept that the carbonic anhydrase of the parietal cell has an important role in the process of acid secretion in the stomach and hence that the parietal cell is the source of the gastric hydrochloric acid.

Studies on Pain Measurement of Aching Pain Threshold and Discrimination of Differences in Intensity of Aching Pain.

J. D. HARDY, H. G. WOLFF AND H. GOODELL (*J. Appl. Physiol.*, December, 1952) report that using pressure upon the subcutaneous tissues of the forehead as the stimulus, they measured the absolute and difference thresholds for aching pain. In a series of 1250 measurements on three subjects the aching pain threshold was observed to be 537 ± 115 grammes. The difference threshold, determined by measuring the intensity of two stimuli evoking a just noticeable difference (jnd) in pain intensity, was 125 grammes at threshold and increased to 1400 grammes for a stimulus of 5200 grammes. Fourteen jnd's were observed in this stimulus range. The direct comparison of intensities of aching and pricking pains showed that pains of equal intensity were above the threshold to the same extent when measured in terms of jnd's. It was inferred from these data that (*a*) measurement of the absolute threshold of aching pain is as precise with this method as that for pricking pain with thermal radiation, if the data are expressed in terms of the jnd, (*b*) aching and pricking pains can be compared as regards intensity, and pains of equal intensity are an equal number of jnd's above threshold, (*c*) the extent of the intensity dimensions for pricking and aching pains is roughly the same, and (*d*) studies of the effects of centrally acting analgesics upon the pain threshold by measuring one quality of pain are applicable to another when the comparison is made in terms of the just noticeable difference.

BIOCHEMISTRY.

Alloxan.

J. M. LEE AND D. STETTEN (*J. Biol. Chem.*, July, 1952) have studied the distribution of isotope in tissues and excreta of rats and rabbits after injection of isotopic alloxan in diabetogenic doses. About two-thirds of the isotope is excreted in the urine within three days by the rat, mostly as an as yet unidentified material. Fæcal excretion is small when compared with renal elimination. In studies with alloxan-1, 3-N^{15}, the isotope in the tissues was recovered in highest concentration in the non-protein nitrogen fractions of the kidney, blood, lung and liver. The pancreas was relatively poor in isotope. All protein fractions were very poor in N^{15}. In several experiments in rats and in glutathione-depleted rabbits,

uric acid-1,3-N^{15} was administered and carrier alloxan was added to solutions of the non-protein nitrogen of the internal organs. Alloxan was reisolated, but in no case could significant concentrations of isotope be demonstrated in isolated products; this finding indicated the absence of significant generation of alloxan from uric acid.

Corticosteroids.

A. ZAFFORONI AND R. B. BURTON (*Arch. Biochem.*, January, 1953) have reported that 17-hydroxycorticosterone and corticosterone were found to be the main steroids present in adrenal vein blood of dogs receiving ACTH. In addition seven other unidentified compounds giving the reactions of α-ketols were found in much smaller quantities. Quantitative data on rates of corticosteroid secretion are presented.

Plasma Proteins.

L. L. FORKER *et alii* (*J. Biol. Chem.*, August, 1952) have introduced into dogs and rats intravenously S^{35}-labelled serum proteins. Labelled protein appeared rapidly in the thoracic duct lymph. The authors state that approximately half of the total blood plasma protein traverses the thoracic duct per day. Evidence showed that the thoracic duct is not essential for the entry of newly formed plasma protein molecules into the blood-stream.

Collagen.

W. VAN B. ROBERTSON (*J. Biol. Chem.*, May, 1952) has studied the formation of collagenous tissue in guinea-pigs. The collagen concentration of healed wounds or of new subcutaneous tissue was not lowered when animals were made scorbutic.

Visceral Gout.

B. T. H. LEVADIE *et alii* (*Arch. Biochem.*, September, 1952) have reported that treatment of chicks with diethylstilbœstrol greatly reduced mortality from visceral gout. This effect was particularly pronounced with male chicks.

Lipogenesis.

G. MEDES *et alii* (*J. Biol. Chem.*, July, 1952) have established the following points using rat tissues: (i) lipogenesis from acetate in liver slices is greatly impaired by fasting or under-nutrition; (ii) the highest rates of lipogenesis from acetate are observed when periods of fasting or food restriction are followed by short periods of refeeding; (iii) lipogenesis from acetate occurs in extrahepatic tissues, although at rates considerably below those in liver; (iv) neither in liver nor in extrahepatic tissues is there any correlation between the utilization of acetate for fatty acid synthesis and the rate of its oxidation to carbon dioxide. Lipogenesis in the "fasting" liver is unresponsive to addition of insulin *in vitro*.

Thyroxine.

A. TAUROG *et alii* (*J. Biol. Chem.*, July, 1951) have injected into rats I^{131}-labelled thyroxine of high specific activity and studied the labelled compounds eliminated in bile. Unchanged thyroxine was the principal I^{131}-containing excretion product found in the bile during the first hour after the intravenous injection of either 15γ or 68γ of labelled thyroxine. Bile samples collected at later intervals, however, contained an unidentified I^{131}-containing component which did not correspond to any of the iodine compounds known to be present in mammalian tissue. In three hours this unidentified component comprised the largest part of the excreted I^{131}. When 75γ of labelled thyroxine were injected subcutaneously, the unidentified I^{131}-containing component was the major I^{131} excretion product, even during the first hour.

Thiosulphate.

J. H. GOST *et alii* (*J. Biol. Chem.*, June, 1952) have demonstrated the consistent presence of two to 17 milligrammes of thiosulphate sulphur in twenty-four-hour urine specimens of healthy young adults. Concomitant studies on urinary total nitrogen and sulphur content indicate that the urinary thiosulphate sulphur probably has its origin in the sulphur of the dietary protein and varies with the latter.

Hydrogen Cyanide.

G. E. BOXER AND J. C. RICKARDS (*Arch. Biochem.*, August, 1952) have demonstrated that traces of hydrogen cyanide are normally excreted in the respiratory air of man and rats.

Fibrinogen.

R. E. MADDEN AND R. G. GOULD (*J. Biol. Chem.*, June, 1952) have studied the turnover rate of fibrinogen using S^{35}-labelled methionine and S^{35}-labelled yeast. In the dog, the average value for 50% turnover was 4·2 days, corresponding to a turnover time of 6·0 days. This turnover rate is faster than that of any one of the major plasma proteins that have been reported, but slower than would be expected from studies on hepatectomized and defibrinated animals. Preliminary results on three human patients indicate an average turnover time of about 8·1 days. The values reported for both man and dog are to be regarded as maximal, since reutilization of isotope undoubtedly occurs to at least a slight extent and will tend to increase the apparent turnover time.

Addisonian Anæmia.

P. R. BURKHOLDER (*Arch. Biochem.*, August, 1952) has isolated strains of bacteria from stomach and jejunum juice of Addisonian anæmia patients, and found that most of these bacteria have a strong tendency to absorb vitamin B_{12} from solution. Concentrates prepared from hog stomach mucosa when added to incubating mixtures prevented the consumption of vitamin B_{12} by the bacteria. The study supported the theory that typical Addisonian anæmia is a disease caused by removal of vitamin B_{12} from the patient's digestive tract by a greatly increased microbial flora under conditions of achlorhydria and lack of intrinsic factor in the gastric region.

Erythrocytes.

D. R. H. GOURLEY (*Arch. Biochem.*, September, 1952) has studied the concentration of phosphate in several acid-soluble organic compounds in human red cells. He states that the experimental data are consistent with the hypothesis that phosphate enters the erythrocyte by formation of adenosine triphosphate on the cell membrane. Although no other organic phosphate compound meets the conditions necessary for being a precursor of cell inorganic phosphate, the possibility that some inorganic phosphate diffuses into the cells is not excluded.

Cholesterol.

G. M. TOMKINS AND I. CHAIKOFF (*J. Biol. Chem.*, June, 1952) have reported that fasting for twenty-four hours or longer reduced the liver's ability to incorporate acetate carbon into cholesterol. Caloric restriction for several days also reduced the liver's ability to form cholesterol.

Creatinuria.

V. M. WILDER AND S. MORGULIUS (*Arch. Biochem.*, January, 1953) have investigated creatinuria in normal males. They state that creatine must be recognized as a normal component of the urine, found regularly in adult healthy men, but in amounts which, on the average, constitute about 6% of the total creatinine output (probably from 60 to 150 milligrammes per day). In females the creatinuria is much more variable, and in the great majority of cases it is from two to two and a half times as great as in males. However, in a small proportion of females (probably 20%) the creatinuria does not exceed that generally found in the healthy male.

Callus Tissue.

P. H. MAURER AND S. S. HUDACK (*Arch. Biochem.*, July, 1952) report the isolation of a polysaccharide from callus tissue of healing rabbit fractures. It is very similar to hyaluronic acid in its chemical properties and in its behaviour towards a pneumococcal hyaluronidase preparation.

Essential Amino Acids.

W. C. RUSSELL *et alii* (*Arch. Biochem.*, August, 1952) have studied the effect of excess of the ten essential amino acids on the growth of rats. Only lysine and methionine caused definite growth repression when fed in excess. It was concluded that the repression is a property of these two compounds and is not due to amino acid imbalance.

Vitamin B_{12}.

P.-T. HSU AND G. F. COMBS (*Arch. Biochem.*, July, 1952) have found that a vitamin B_{12} deficiency in chicks significantly increased the blood levels of non-protein nitrogen, amino-nitrogen, urea nitrogen, creatinine and glucose as compared with those of chicks receiving crystalline vitamin B_{12}. The level of uric acid was not consistently affected. The findings further suggest that vitamin B_{12} is involved in nitrogen metabolism in the chick.

Uric Acid.

J. BUZARD *et alii* (*J. Biol. Chem.*, May, 1952) studied the fate of isotopic uric acid injected intravenously into three normal healthy men on two separate occasions. The mean daily excretion of uric acid, as determined by the isotope dilution method, was found to be only 60% to 75% of the predicted excretion as calculated from the pool size and turn-over rate. The findings, together with others which report N^{15} fragments (urea) after the injection of N^{15} uric acid, suggest that uric acid may not be the sole end-product of purine metabolism in the human.

Special Articles for the Clinician.

(CONTRIBUTED BY REQUEST.)

LXVII.
ANAL BLEEDING.

APART from the physiological losses sustained by women in menstruation and parturition, the issue of blood from one of the body orifices is an event which demands careful consideration.

The passage of blood from the anus is not a very rare occurrence, and rather unfortunately it is apt to be thought of minor importance by many of the laity, as to them it signifies but one condition—"piles". In general, this diagnosis is not one that carries a sinister outlook. This sign, however, is one which requires investigation in all cases. There are a large number of pathological lesions which may present it as their primary or most outstanding feature.

Blood in the motions may be frank and obvious, that is, recognizable by naked eye inspection, or occult, found only by microscopic examination of the fæces or revealed by special tests for hæmoglobin and its derivatives. The tests for occult blood are of great importance in the investigation of disease of the gastro-intestinal tract and should frequently be carried out. However, the technique of these tests and the significance of positive and negative findings merit fuller consideration than can be afforded in this article.

All the conditions mentioned as sources of frank bleeding obviously will give a positive result in tests for occult blood, and if there is any doubt, on naked eye inspection, as to the presence of blood, such a test should be performed. Repeated negative results of occult blood tests, carried out over several weeks, form a strong presumption against the presence of an active lesion, such as carcinoma, anywhere from the mouth to the anus. This, however, cannot be taken as absolute proof and must always be considered in relation to the whole clinical picture.

Blood may be seen in various guises—a bright red flow which drips from the anus at and after stool, darker blood more or less incorporated with mucus in the motions, or the shining black motion, really closely resembling tar, which is properly described as melæna.

Each of these variants has its own significance: the first is the bleeding typical of hæmorrhoids, the blood flowing from the ruptured prolapsed piles; the second variety of blood loss is that which signifies a lesion higher in the colon; the last, the true melæna, usually signifies bleeding high in the gastro-intestinal tract above the mid-small gut. As in all clinical problems, the patient who complains of passing blood should be investigated by interrogation first, then by physical examination, and thirdly by special methods of examination.

Although this sign may occur throughout life, the age of the patient may be of some significance. Apart from hæmorrhagic diseases of the new-born, in infants and young children anal lesions, such as trauma causing abrasions or fissures, are probably the most common examples. In young adults hæmorrhoids are not uncommon, and infective conditions of the colon are found. In later life, apart from all these, the question of carcinoma is ever present. Of course there are many other lesions of less frequent occurrence.

It is impossible to give a full list of the lesions which may cause the passage of blood, with their corresponding typical stories, but perhaps it may be useful to enumerate those of more common occurrence at the different sites and then discuss some of their main features.

The following lesions cause hæmorrhage:

1. In the anal canal: hæmorrhoids, fissure, rarely fistulas.

2. In the rectum: carcinoma, polypi, proctitis, ulcerative lesions of non-specific (chronic ulcerative colitis) or specific (amœbic or bacillary dysentery) ætiology.

3. In the colon: those mentioned as occurring in the rectum, diverticulitis, acute volvulus, entero-colonic intussusception.

4. In the small intestine: mostly acute infections, such as enteritis and typhoid, and such acute lesions as intussusception and volvulus; rarely bleeding from a peptic ulcer or a Meckel's diverticulum or carcinoma.

5. In the stomach and duodenum: bleeding from peptic ulcers, gastrostaxis, carcinoma of the stomach or varicosities associated with portal hypertension.

The first step in diagnosis is to find out if possible the exact nature of the stool passed. This is by no means as easy as it may seem, as the majority of patients either fail to examine their motions critically or do not have adequate facilities to do so.

The presence of red blood on the motions or on the toilet paper, and particularly when it drips from the anus at stool, usually signifies hæmorrhoids. The patient himself may feel them protrude and thus help to establish their presence. Digital examination may not be reliable in confirming this presumption, but examination with a tubular anal speculum is usually easy and should always be carried out.

Even the presence of hæmorrhoids is not always to be accepted as a final diagnosis, as they may be associated with and even due to a carcinoma in the rectum. It should be remembered that 90% of all rectal carcinomata can be felt by the examining finger if diligently sought.

Regular bleeding from hæmorrhoids over a long period may produce severe anæmia with constitutional disturbances.

The bleeding from fissures and from fistulous granulation tissue is a mere streak, and the other diagnostic features are usually self-evident.

The origin of profuse bleeding from lesions higher than the anus is a little more diverse.

Hæmorrhage without other signs or symptoms may arise from polypi in the rectum or colon and is sometimes the first sign of the rather rare condition of familial polyposis.

Whilst bleeding is supposed to be of rare occurrence in diverticulitis, there is sometimes some bright blood passed in an acute attack accompanied by the classical local signs in the left iliac fossa. But it is not generally recorded that profuse hæmorrhage which may give rise to immediate anxiety does also occur in diverticulitis.

In all these conditions an examination with the sigmoidoscope should be first made, and then if nothing definite is seen a barium enema examination carried out.

Other rare conditions which are the cause of profuse hæmorrhage and passage of blood which is usually red and not typical melæna are peptic ulceration of ectopic gastric mucosa in Meckel's diverticulum, and ulceration of the caecum.

Acute proctitis is not common, but may be due to gonococcal infection or to some non-specific cause. In the acute phase it is manifest by frequent motions with much tenesmus and the passage of mucus, mucopus or more or less pure blood.

Bilharziasis does not occur in Australia, but there have been cases of returned soldiers who have been infested whilst on service in the Middle East. *Schistosoma mansoni* produces thickening and polypoid granulations in the rectum which discharge blood and mucus.

The passage of blood-stained stools occurs in many of the conditions which are manifest by acute abdominal symptoms. These are usually diagnosed by a consideration of the whole clinical picture of which the passage of blood is but one feature. The more common of such lesions are acute intussusception in young children, volvulus of the pelvic colon or ileo-cæcum, mesenteric vascular occlusion, acute entero-colitis, infective diarrhœa and the dysenteries.

A rare condition occurring mainly in early childhood and giving rise to passage of bloody stools is Henoch's purpura. It is characterized by abdominal pains and perhaps a palpable mass in the abdomen, but usually a purpuric skin rash points to the diagnosis.

In many of these conditions the appearance of the motions is of some diagnostic value. In intussusception they have been described as resembling "red currant jelly", in bacillary dysentery they are also so designated and are small, gelatinous and odourless, whilst in amœbic dysentery they are copious and offensive and called "sago-grain" or "anchovy sauce" stools. The propensity of the older physicians to compare stools and many other pathological items with common articles of food has often been deprecated, but at least the comparisons are usually apt.

Perhaps the most dramatic of all anal bleeding is the melæna from hæmorrhage high in the gastro-intestinal tract. By far the commonest cause of this is a chronic duodenal ulcer. Hæmatemesis may also occur, but is much more common with gastric ulcers and the varicosities of portal hypertension.

The typical story in the case of a duodenal ulcer is that the patient has a sudden attack of syncope or at least feels light-headed and dizzy, then some time later passes a copious foul motion, bright and tarry. Sometimes when there is great intestinal activity the blood rapidly passes through and still retains the red tint, but it is nevertheless dark and foul-smelling.

The fallacy of mistaking the stool darkened by a medicament is well known. The most common which may give rise to doubt are iron, bismuth and charcoal. In the case of iron the stool is black but dull-looking; with bismuth the colour is a dark dull green and thus should not be confused with true melæna.

Of the lesions which cause repeated hæmorrhages from the intestinal tract the most important are malignant ulcers. Unfortunately, in practically all such cases the blood is not lost in large quantities at one time so as to compel attention.

Carcinoma is not uncommon in the large bowel, but is quite rare in the small gut. It occurs most frequently in the rectum, then in the neighbourhood of the pelvi-rectal junction and the pelvic colon. Of the rest of the colon the caecum and ascending colon are the most frequent sites.

Practically all of these growths bleed, most of them persistently, but only a small amount at a time. Thus it may be said with some degree of confidence that a very severe bowel hæmorrhage is unlikely to indicate carcinoma.

Blood from carcinoma of the pelvic colon and rectum is usually not intimately mixed with the motions, but appears on their surface. However, as in these cases mucus is also present, the motion frequently consists merely of blood and mucus.

Blood from carcinoma of the right side of the colon becomes incorporated in the stool and may not be very apparent. However, since the carcinomata of the right side of the colon are apt to be of the free-growing fungating type, blood loss is continuous and may so deplete the patient that severe anæmia may develop and indeed be the first indication of the disease. The patient does not always notice this type of blood in the fæces, but there are other features which help in the diagnosis.

It should be remembered that practically all patients who have a carcinoma of the large gut present one or more of these three outstanding clinical features: altered bowel habitus, altered stools, abdominal discomfort or pain.

It is indeed a great pity that the blood passed is not more remarkable in such cases, as this would materially contribute to their earlier diagnosis. These growths are of extremely slow evolution, and their surgical treatment in the earlier stages is more satisfactory than that of other visceral carcinomata.

Once suspicion is raised by a patient presenting with the story of passing some blood, especially if it is accompanied by mucus, an investigation should be carried out by the routine of digital examination, sigmoidoscopy and, if no growth is seen in the last ten or twelve inches of the bowel, barium enema examination.

Unfortunately, there is no doubt that patients suffering from carcinoma of the rectum still have injections or operations for "piles" or treatment with all the available antibiotics for their "dysentery" or "ulcerative colitis". Thus it is necessary to insist that everyone who consults a doctor with the complaint of passing blood should without fail have a digital examination of the rectum carried out.

There is a well-known saying, "If you don't put your finger in, you put your foot in it." This is probably known to all who practise medicine, but by its very repetition it has lost its force and has become as sounding brass or a tinkling cymbal. It should be engraved on the heart of every practitioner.

NEVILLE G. SUTTON,
Brisbane.

British Medical Association News.

SCIENTIFIC.

A MEETING of the South Australian Branch of the British Medical Association was held on February 26, 1953, at the Verco Theatre, Institute of Medical and Veterinary Science, Adelaide.

The Early Diagnosis of Cervical Carcinoma.

DR. R. F. MATTERS read a paper entitled "Early Diagnosis of Cervical Carcinoma, with Special Reference to General Practice" (see page 874).

DR. R. M. MACINTOSH, in opening the discussion, said that the early diagnosis of carcinoma of the cervix seemed to him to fall into two phases: (i) carcinoma which was early pathologically, but symptomless; (ii) that which was early from the point of view of symptoms. That, of course, was not often early in a pathological sense. They had to consider both those phases from the aspect of the patient and from that of the doctor. Women would have to be taught that after the age of forty years they were candidates for carcinoma of the cervix, particularly if they had had children, and that they should have regular periodical examinations after that age. Dr. MacIntosh said that he did not mean that they should produce a population of cancerophobes, but rather that they should be taught that cancer in its early stages could be cured. That, of course, was hopeless at the present time if it was to be done *en masse*. It was not a job for the general practitioner, nor for the out-patient department of a public hospital—neither would have the time. Special diagnostic clinics would need to be set up, and that would involve considerable organization and money. It was, however, a hope for the future.

Dr. MacIntosh went on to say that women had also to be taught that irregular or intermenstrual bleeding needed investigation. There was no such thing as "menopausal bleeding"—there was always a reason for such bleeding, even though in many cases it was simply due to a minor endocrine dysfunction.

From the point of view of the doctor, as Dr. Matters had pointed out, an examination by speculum should never be omitted. That applied whether hæmorrhage was occurring or not. If any suspected lesion was seen, it should be investigated, preferably by adequate biopsy by one of the methods that Dr. Matters had described. Schiller's iodine test could be used as a guide. With regard to the Papanicolaou smear, Dr. MacIntosh said that he doubted its practical importance at present, as it required a good deal of a highly trained pathologist's time, and results might be fallacious if it alone was relied upon. Its value appeared to lie in the detection of carcinoma when no visible lesion could be found; many hundreds of patients might be examined by that method before a smear with positive findings was found.

Finally Dr. MacIntosh stressed three points in diagnosis: (i) Every patient who complained of irregular hæmorrhage should be examined bimanually and by means of a speculum. (ii) Hormones should not be given before a diagnosis had been made by examination and diagnostic curettage if necessary. Dr. MacIntosh considered that the latter procedure was likely to do more good to the premenopausal patient than the hormones. (iii) Subtotal hysterectomy should not be performed on any parous patient, or on any woman aged over thirty-five years, and if a subtotal hysterectomy had to be performed, one should be absolutely certain first that the cervix was healthy.

DR. B. S. HANSON said that one hundred years earlier Virchow, who first made biopsy examination popular, stated that a single malignant cell could not be distinguished from a normal one, and that the malignant character could be assessed only by observing the relation of malignant cells to their normal neighbours. Except for those giant malignant cells—perhaps 50 times normal size—that still held true. But smear examinations were not thereby invalidated, because groups of cells were frequently available for examination by that method. Whether smear examination of the uterus was worth while was open to argument. It was expensive, in that a histopathologist could scarcely be asked to examine the slides from more than ten patients per day, amongst his other histological work, and to do that he might need up to four "screeners"—trained technicians who would separate out the entirely normal from the "doubtful" slides. There might be private pathologists with the necessary skill, as distinct from those at the Institute of Medical and Veterinary Science; but at the latter place Dr. Fowler, who had recently been sent abroad by the Anti-Cancer Campaign Committee to learn smear techniques, was available to make such examinations if required.

In reply to Dr. MacIntosh, Dr. Hanson said that in all sites, and not only in the *cervix uteri*, there was a difference between radiosensitivity and radiocurability. The anaplastic radiosensitive tumour might appear to resolve quickly; but in such tumours distant spread had often occurred early, and the cure rate was less than that of the more differentiated and superficially more resistant tumours in the same site.

DR. B. H. SWIFT said that he hoped that all members who had passed through the Adelaide medical school would know how to use a bivalve speculum and how to perform a biopsy of the cervix. They had always been taught to perform a biopsy on any lesion which they thought suspect. Dr. Swift discussed the danger of repeated electric cauterization of an eroded area that did not heal, and he went on to say that any eroded area which had been cauterized on several occasions and went on bleeding was the type from which a biopsy should be taken, as it was most probably malignant.

Dr. Swift then discussed the problems of intraepithelial carcinoma of the cervix. He said that the whole question at the present time seemed to him to be in a state of uncertainty. Over forty papers had appeared in journals which he had read during the last year; no really definite conclusions had been reached regarding either diagnosis or treatment of the condition. Dr. Swift quoted two papers (published in *Surgery, Gynecology and Obstetrics* in January, 1952, and January, 1953) on changes in the cervix during

pregnancy. Nesbith and Hellman, in the first paper, had reported the results of biopsies on 300 pregnant patients, in which they had found varying types of basal cell change. Those authorities had found seven patients with intra-epithelial carcinoma whom they had followed up, and all had returned to normal and had remained so. The other paper published by Green *et alii* quoted 14 cases which they described as of preinvasive carcinoma; they had in a series of biopsies of cervices from pregnant women followed them up during pregnancy and the puerperium, and they stated that the appearances were definitely due to intraepithelial carcinoma and not pregnancy changes.

Dr. Swift then discussed the time involved and the cost of performing vaginal smear examinations in all cases. He said that in a series of over 20,000 examinations at the Strang Prevention Clinic in America, 31 cases of intra-epithelial carcinoma of the cervix had been found. Dr. Swift pointed out the enormous amount of work that was involved for the detection of 31 cases only. He also quoted a paper by Douglas M. Haynes *et alii* (*J.A.M.A.* (1952), 148: 457), who had worked out that the cost of discovering a case of unsuspected clinical carcinoma was $357.45 exclusive of professional fees. Dr. Swift then asked in what type of case the smear technique should be used. He said that it was not essential in every gynæcological case. Irregular bleeding should be investigated, and then the burden of diagnosis was thrown on the pathologist, who had to have a long and thorough training in these modern methods.

Dr. Swift said that he was very unhappy over the present state of cancer of the cervix with regard to both treatment and prognosis. He said that 20% to 30% of patients with Stage I carcinoma had been found at operation to have obturator and iliac glands involved and had died quickly, whereas on the other hand some patients with Stage III carcinoma often lived for years with no alteration in their pelves.

Dr. Swift thanked Dr. Matters for bringing before the meeting the importance of examination of the cervix with a speculum and of the taking of biopsies.

A MEETING of the New South Wales Branch of the British Medical Association was held on December 5, 1952, at the Saint George Hospital, Kogarah, New South Wales. The meeting took the form of a series of clinical demonstrations by members of the medical and surgical staffs of the hospital. Parts of this report appeared in the issues of May 16 and 30 and June 6, 1953.

Uterus Bicornis Unicollis.

DR. SYDNEY HING showed a married woman patient with bicornuate uterus. He pointed out that the hystero-salpingogram showed the horns of the uterus quite well. Another unusual feature was the length of the Fallopian tubes, which reached up into both lumbar regions. The patient's first child had weighed five pounds two ounces and had been born in the obstetrics department of the Saint George Hospital three weeks before the estimated date. The pregnancy was carried in the right cornu. The mother was given a course of "Lipo-Lutin" prophylactically during the early months. Her second pregnancy was carried mainly in the left horn, as the photographs presented showed. She was given the usual course of progesterone, but was admitted to hospital with threatened premature labour at about the thirty-second week of pregnancy. She was subsequently delivered of a live child, weighing three pounds seven and a half ounces and about five weeks premature. Photographs were presented showing the contour of the patient's abdomen three days before her confinement. Dr. Hing commented that the patient's condition was beyond doubt one of bicornuate uterus. The question of spasm of the uterine body giving rise to a bicornuate effect in the hysterogram could be disposed of readily. The patient had had three lots of hystero-salpingograms taken (excluding those taken twenty-four hours afterwards to show peritoneal spill), first in 1947 and then twice in 1952. Each radiographic plate showed the well-marked bicornuate appearance. It was clearly seen even where there was tubal spasm, as in one series of plates. In addition, during the latter half of pregnancy the fœtus was readily palpable in one horn, while the other horn was much smaller and easily felt as such. The photographs displayed confirmed the findings.

Broad Ligament Tumour.

Dr. Sydney Hing's second patient, a married woman, aged thirty-five years, had been referred to the out-patient clinic own doctor had investigated her renal system, in the course of which an excretion pyelogram was made. The plates, which were displayed, showed the presence of a fairly large filling defect involving the left half of the bladder. Vaginal examination revealed a normal anteverted uterus and a firm mass in the left fornix. The mass was the size of a small orange and slightly tender and was felt quite distinct from the body of the uterus. A provisional diagnosis of "left ovarian mass" was made, and the patient was admitted to hospital for curettage and section. At operation a mass was found within the layers of the left broad ligament. It appeared to be separate from the uterus, while the left ovary was perfectly normal. The broad ligament was incised, and a firm tumour was easily shelled out between the layers of the ligament. A short and narrow pedicle connected the tumour to the side of the uterine body. That was cut and tied, and the mass was removed. The incised leaf of the broad ligament was sutured. The patient's convalescence was uneventful, and she was relieved of her urinary symptoms. The specimen was one of a fibromyoma. It was a pedunculated fibroid tumour, which had steadily grown laterally within the broad ligament, finally giving rise to urinary symptoms from pressure on the left half of the bladder. Microscopic sections, which were shown at the meeting, confirmed the macroscopic appearances.

Hydatidiform Mole.

Dr. Sydney Hing then showed a married woman patient, aged thirty-two years, who had been admitted to hospital after three months' amenorrhœa with the provisional diagnosis of threatened miscarriage. She had had a sudden loss of blood *per vaginam* with very little pain. Her history showed that during her previous confinement she had had "shows" simulating mentrual periods. However, the abdominal mass was now more consistent with a five months' gestation. About three hours after admission to hospital the patient passed a large hydatidiform mole (which was displayed at the meeting). A little bleeding occurred, and some vesicles were passed at intervals. Dr. Hing said that he saw the patient on the following day and explained her condition to her. She was quite intelligent and cooperative. She was the mother of five children already, and she and her husband were in complete accord in not wanting any further children. After very careful thought on the merits of the case and consideration of the patient's wishes, Dr. Hing decided, at the risk of severe criticism, to perform total hysterectomy. That was carried out. The uterus removed was displayed at the meeting. It was six by four and a half by three inches in size. The endometrium was covered with shaggy material and blood clot. Examination of microscopic sections showed blood clot and trophoblastic elements undergoing hydatidiform degeneration.

Dr. Hing commented that something like 50% of the reported cases of chorionepithelioma followed hydatidiform moles. Because of that and the couple's unanimous insistence that with five children they desired no more and that they were unable economically to support another, he had been prompted to act radically in the present case. It was not an easy decision to make; but after due consideration, total hysterectomy was in his mind quite justified. He said that it was interesting to note that, while Hertig and Edmonds in 1940 and Meyer earlier in 1921 had estimated that the over-all occurrence of hydatidiform degeneration of chorionic villi lay in the region of 4% of all human pregnancies, Novak considered that the hydatidiform mole was a comparatively rare disease occurring once in 2500 pregnancies. Of course, mere hydatidiform degeneration did not mean necessarily mole formation. Two laboratory tests were used in the investigation, control and treatment of hydatidiform mole and its deadly complication chorion-epithelioma. H. Pigeaud and R. Burthiault used the estimation of pregnandiol in urine as a measure of the activity of moles. Abnormally high levels indicated a very active mole, while a low level indicated a dead or very inactive mole. A persistently high level after expulsion of the mole would suggest chorionepithelioma. It was also a recognized fact that a long interval might exist between the last recognizable pregnancy and the onset of chorionepithelioma. Poiano had collected 11 cases with latent intervals of from five to thirteen years, and in some cases the condition had occurred after the menopause. The Aschheim-Zondek test was used more widely. Usually, a high concentration of gonadotrophic hormones in the urine (for example, a positive result in a dilution of 1:500 or more) was practically pathognomonic of hydatidiform mole or chorionepithelioma. Of course, the level varied considerably at different times even in normal pregnancies. However, a negative or weakly positive result did not necessarily exclude the presence of chorion-epithelioma. That was shown by several cases reported by

complaining of pains on the left side for seven years; she had also had "floodings" and urinary frequency with a burning sensation on passing urine for five months. Her different authors, so that caution must be adopted in placing too much reliance on the test. Each case must be evaluated by the clinical features and the histology, as well as by the laboratory tests.

Intestinal Obstruction Resulting from Use of Butterfly Spring Pessary.

Dr. Sydney Hing's last patient was a married woman, who had been referred to him by an outside doctor. She had been a patient of that doctor for several years and was known to be wearing a gold butterfly spring pessary which the doctor had advised her to have removed. Several days prior to the patient's admission to the Saint George Hospital, the doctor had removed the pessary in his rooms. It was noted that the patient was very sensitive on vaginal examination and that a small quantity of purulent matter issued from the *os uteri* on removal of the pessary. The patient was advised by her doctor to enter a private hospital for examination under anæsthesia. On July 11, 1952, she had a "Pentothal" anæsthetic administered and was examined *per vaginam*. A mass was felt in the posterior fornix. The mass was felt to burst, and her doctor performed a posterior colpotomy, following which there was an escape of about half an ounce of pus. Later in the afternoon the patient's condition deteriorated rapidly, and she was admitted to the Saint George Hospital under Dr. Hing's care. An anxious resident medical officer rang Dr. Hing to say that the newly admitted patient was moribund. She was unable to give any coherent history. Her temperature was 102·5° F. and her pulse rate 130 per minute. Respirations were rapid and shallow. The tongue was dry and coated. The abdomen was rigid and extremely tender, especially in the lower half. Vaginal examination revealed little information, as she was very tender. No pus was issuing from the colpotomy wound. Her condition was one of established acute peritonitis following a pelvic abscess. Strenuous measures were instituted in the form of glucose-saline drip administration to combat dehydration and the free use of antibiotics. Her leucocyte count on the day of admission to hospital was 16,500 per cubic millimetre and her hæmoglobin value was 9·7 grammes *per centum*. She was given two litres of blood during the course of the illness, and after three weeks of steady improvement she was transferred to Primrose House for her convalescence. She was discharged to her home on August 9, 1952, feeling well. On September 5 she was readmitted to the Saint George Hospital with the history of colicky abdominal pains commencing several days previously. The pains had become worse and were centred around the umbilicus. She had vomited five times on the day before admission to hospital, her bowels had not moved for twenty-four hours, and there was no passage of flatus. On examination of the patient the abdomen was found to be distended and tender, especially in the lower half. Guarding was present but no rigidity. Vaginal examination showed a retroverted non-mobile uterus with tenderness in the posterior fornix. Suction was commenced immediately, intravenous drip therapy was instituted, and antibiotics were administered. On September 6 laparotomy was carried out. The diagnosis of subacute intestinal obstruction was confirmed. Numerous bands and adhesions were present between loops of the small bowel. The adhesions were separated, and the bands were cut and tied. The uterus was bound down in a retroverted position, the lower pole being closely applied to the anterior wall of the rectum. The uterus was left undisturbed. The adnexæ were normal. The patient was returned to the ward, and her recovery was uneventful. She was discharged from hospital on September 27.

Dr. Hing said that the use of the butterfly spring pessary for contraceptive measures could not be too strongly condemned. Its action was mechanically irritant and brought about chronic endometritis. If pregnancy ensued, the pessary acted as an abortifacient in the early weeks of pregnancy. In some cases, as in two of Dr. Hing's own, subsequent total hysterectomy was necessary. In one case the patient had worn her pessary for nearly twenty years, and it had been so firmly embedded that removal *per vaginam* even under anæsthesia was impossible. In the second case the pessary had been removed fairly easily under anæsthesia, but the chronic metritis and parametritis subsequently made it necessary to perform a total hysterectomy. A third patient of Dr. Hing's had had the pessary removed without anæsthesia and had suffered no apparent complications. Dr. Hing said that in the case under review it seemed that after the removal of the pessary, a pelvic abscess had formed in the pouch of Douglas, leading to peritonitis and then to intestinal obstruction. Whether there was an actual perforation in the lower pole of the uterus he was not able to demonstrate, as the dense adhesions there of the resolved abscess were left undisturbed. However, it was reasonable to assume that the pessary was eroding the uterine wall to perforation or near perforation point.

Pathology Specimens of Interest.

Finally, Dr. Sydney Hing showed two pathology specimens of interest.

Large Nabothian Cyst.

The first one was an opened uterus with a thin-walled cyst occupying the cervical canal. The cyst was an unusually large Nabothian cyst. There were accompanying microscopic sections. Dr. Hing said that pre-operatively the diagnosis of fibromyoma of the uterus and cervix had been made, and it was not until after the uterine cavity had been incised that the cyst was seen. The external os was closed and so concealed its presence. The interesting features of the case were the occurrence of menorrhagia and the history of seven previous attacks of thrombosis in the legs. The patient was a candidate for post-operative thrombosis and the cooperation of a physician (Dr. J. C. English) had been sought. The patient was given vitamin *E* therapy and her post-operative clotting time closely watched. It was found to be unnecessary to administer heparin, and the patient's recovery was uneventful after one or two false alarms. She had had physiotherapy throughout.

Peripheral Calcification and Red Degeneration in a Fibromyoma.

Another specimen with microscopic sections was included because of the degenerative changes seen. The uterus contained an intramural fibroid tumour with a well-defined thin calcareous ring around the whole of its periphery. In addition the centre of the tumour showed red degeneration, the calcification usually following the red degeneration.

Urological X-Ray Films of Interest.

DR. G. PFEIFFER and DR. R. I. CAMPBELL presented urological X-ray films of interest. The first one was of a woman, aged twenty-eight years, who had suffered from progressive loss of weight for six months with daily pyrexia to 100° F. A mass was found in the kidney. Excretion pyelography narrowed the diagnosis to either renal neoplasm or a single cyst of the lower pole of the kidney. At operation, a large single cyst was found filled with pus. The excretion pyelogram was now normal. The second patient, a woman, aged thirty years, had had bilateral pulmonary tuberculosis and a large right renal mass. Pyelography revealed the presence of a renal neoplasm. The condition of the chest had deteriorated rapidly. The result of sputum examination was negative. The question was whether the pulmonary condition was due to metastases or to an extension of the pulmonary disease.

Exophthalmic Ophthalmoplegia.

DR. EUNICE WILSON showed a woman, aged forty-nine years, suffering from exophthalmic ophthalmoplegia. Her visual acuity in the right eye was 6/12 and in the left eye 6/9. Her basal metabolic rate was +8%. She suffered from diplopia when looking up and to the right, due to paresis of the right superior rectus muscle. The patient was awaiting admission to hospital for advancement and resection of the right superior rectus. Dr. Wilson said that the onset of the exophthalmos had been sudden and it had remained unchanged for ten years.

Public Health.

SUMMARY OF THE FACILITIES AVAILABLE FOR THE CONTROL OF TUBERCULOSIS IN AUSTRALIA.

THIS report has been prepared by the Laennec Society, the medical wing of the National Association for the Prevention of Tuberculosis in Australia.

Introduction.

This report is intended to be only a summary, collating and contrasting the facilities available for control of tuberculosis in the various States. Owing to the very different geographical features met with throughout the Commonwealth, there are considerable differences as regards the problem in each State. Thus Tasmania, being small

TABLE I.

Tuberculosis: Treatment Facilities, Notifications and Deaths.

State.	Repatriation Hospital and Sanatorium Beds in Use.	Civilian Hospital and Sanatorium Beds in Use.	Total Notifications (All Forms.)			Total Deaths.		
			1949.	1950.	1951.	1949.	1950.	1951.
New South Wales ..	538	996	1641	1787	1746	769	671	681
Victoria	340	917	814	836	1046	587	432	406
South Australia ..	100	330	251	363	376	144	132	120
Western Australia ..	124	291	533	559	590	128	128	82
Queensland	140	265	434	595	699	256	236	—[1]
Tasmania	50	162	102	210	236	60	73	65
Total	1292	2961	3775	4350	4693	1944	1672	1354[2]

[1] Figures not available.

[2] Queensland figures not included.

in both size and population, is able to do far more relatively than Queensland, where the area is vast and where also there is the added complex problem of the aborigines.

Commonwealth Government Agencies.

The extent of the great impetus given to the control of the disease by the passing of the *Tuberculosis Act* of 1948 and the subsequent implementation of the "tuberculosis arrangement" with the States is well known. Up to June 30, 1951, the total reimbursements to the States for both maintenance expenditure and capital expenditure was £1,930,475, whilst payments made under the tuberculosis allowances for the year ending June 30, 1951, totalled £1,344,890. The latest figures available from the Commonwealth Statistician show that on March 31, 1953, there were 5868 persons receiving allowances. It is of interest to note that in Western Australia (the only State for which these figures are available) 15% of those in receipt of allowances were recent migrants and over half of these were displaced persons.

TABLE II.

Expenditure under Tuberculosis Act from July 1, 1948, to January 31, 1953.

State.	Capital Expenditure.	Maintenance Expenditure.	Tuberculosis Allowances.	Total.
	£	£	£	£
New South Wales	332,416	1,325,961	1,658,575	3,316,952
Victoria	908,086	1,990,112	1,238,245	4,136,443
Queensland ..	370,928	243,236	423,710	1,037,874
South Australia ..	47,674	207,318	407,092	662,084
Western Australia	101,865	651,949	297,731	1,051,545
Tasmania ..	93,203	251,700	216,558	561,461
Total ..	£1,854,172	£4,670,276	£4,241,911	£10,766,359

The Commonwealth, through the Repatriation Department, cares for all ex-servicemen and ex-servicewomen sufferers, and it is sufficient to say that if civilian patients could be cared for on the same scale, the problem of the control of tuberculosis in Australia would be greatly facilitated. (See Table I for number of Repatriation beds *et cetera*.)

The Commonwealth is also responsible for carrying out Mantoux tests, X-ray examination, and where necessary B.C.G. vaccination upon all National Service trainees.

The Commonwealth Rehabilitation Section of the Department of Social Services provides certain facilities for training certain classes of patients in suitable useful occupations, but at present this scheme does not nearly cope with the vexed problem of rehabilitation.

State Government Agencies.

Each State through its department of health administers its own set-up as regards diagnostic, hospital and sanatorium services, and each State has its own peculiar difficulties to overcome.

Diagnosis and Surveys.

There are chest clinics, some of them with mobile X-ray units, in all the capital cities and some of the larger country towns, where any person may be investigated free of charge.

Various groups of schoolchildren have had Mantoux tests and B.C.G. vaccination in different States, but there is no concerted B.C.G. campaign for schoolchildren generally. However, "contact" children may be given B.C.G. at the chest clinics; and other susceptible groups, such as nurses and university students, are also investigated and vaccinated. Most ante-natal clinics provide X-ray examinations as routine. In Tasmania chest X-ray examinations are compulsory for all persons from the age of fourteen to sixty-five years, and a recent compulsory X-ray survey was carried out in the population of the Australian Capital Territory. Some surveys have been carried out in selected districts and also on some special groups of workers in industry, such as the waterside workers in Sydney. It is of great interest to note that the Department of Territories undertook a campaign in New Guinea when a very large number of natives were Mantoux tested and, where necessary, vaccinated with B.C.G.

Bovine Infection.

Whilst there are no accurate figures on the extent of infection due to the bovine bacillus, yet such infection is thought to be small in this country. Some States have legislation providing for the testing of dairy herds with the destruction of infected cattle, but other States do not enforce this. Pasteurization of milk is not compulsory, although some large dairy companies do process their milk.

Hospitals and Sanatoria.

Whilst, in the main, diagnostic services are adequate throughout the country, in some States there are not enough beds to accommodate the waiting patients and many of the sanatorium buildings in use are inadequate and obsolete. It is regrettable to know that, mainly owing to lack of staff, there are many badly needed beds not in use.

As well as those run by the State governments, there are clinics, hospitals and sanatoria controlled by private bodies, whose work in many cases also extends into the diagnostic and educational fields; thus in New South Wales the Red Cross Society maintains 154 beds at three sanatoria and the Queen Victoria Homes 122 beds at two sanatoria.

With more and more surgical therapy being advised there is a growing need for more teams of trained surgeons. This fact can be appreciated when it is known that Queensland has only two recognized thoracic surgeons.

Facilities for Children.

Some States have adequate beds available for children suffering from pulmonary tuberculosis. However, more beds are needed generally when, for example, in Sydney the Royal Alexandra Hospital for Children will admit patients suffering from tuberculous meningitis and surgical tuberculosis, yet it will not admit any patient diagnosed as suffering from pulmonary tuberculosis, but does treat any patient admitted for other reasons and diagnosed as having pulmonary tuberculosis while in hospital.

Occupational Therapy and After-Care.

For patients in hospitals and sanatoria there are generally good occupational therapy services, and visiting almoners and nurses do much to help the domiciled patients. The problem of accommodation for ex-patients of sanatoria and the like has not been fully tackled. In Hobart, "NAPTA" runs an after-care hostel for single male ex-patients, and similar hostels are needed in all States for both men and women.

Rehabilitation.

In addition to the Commonwealth Government scheme, various private bodies are undertaking activities in this field; thus in Western Australia there are two and in South Australia one sheltered factory for sufferers who are unable to do full-time work. Similar factories are planned in other States.

Preventoria.

Western Australia and South Australia have each a preventorium to accommodate healthy children of tuberculous parents. In New South Wales, there are convalescent homes and also some church institutions where accommodation can readily be obtained for healthy children.

Aborigines.

A survey in Queensland in 1950-1951 disclosed "a disquieting degree of infection in Mission and State Settlement Natives". Some of them are being treated in sanatoria and general hospitals, and in one hospital on Thursday Island.

Anti-Tuberculosis Associations.

There are a number of associations, both ex-service and civilian, which do much to help in the welfare of individual sufferers and their dependants, besides aiming to promote research and to educate the public in the matter of tuberculosis control. The State departments of health use roadside hoardings as well as signs on transport department vehicles, advocating mainly the advisability of having chest X-ray examinations. The radio is being used for education and propaganda, and it is felt that much more use of these avenues should be made in the future.

Conclusions.

From the foregoing remarks it can be seen how the facilities differ greatly in the different States. However, with funds being made available by the Commonwealth Government, increasing inroads are being made into the problem all the time.

The following suggestions are appended as being logical steps to bring tuberculosis fully under control and finally to eradicate it throughout the Commonwealth.

1. The building of modern sanatoria and chest hospitals, since it is now accepted that the beds required for treating sufferers bear a direct relation not to the mortality rate but rather to the attack and morbidity rates.
2. Routine X-ray examination of all out-patients and in-patients of all hospitals.
3. Widespread research, including all medical and sociological aspects with emphasis upon epidemiological surveys and studies.
4. Commonwealth-wide testing of dairy herds with destruction of infected cattle. Pasteurization of milk and delivery of milk in sealed containers.
5. Development of adequate rehabilitation and after-care services.
6. Elucidation of the aborigines problem.
7. Admittance of only healthy migrants.

Out of the Past.

In this column will be published from time to time extracts, taken from medical journals, newspapers, official and historical records, diaries and so on, dealing with events connected with the early medical history of Australia.

QUACKERY.[1]

[*Australian Medical Gazette*, December 15, 1870.]

To the Editor of the *Australian Medical Gazette*.

Sir,

The medical act intended to be for the suppression of illegal practice seems to be inoperative. Where I reside there are two individuals practising as medical men without any qualification whatever. One is an ex-publican, the other a working miner. The latter, a worthless drunken sot, has got up a petition to be appointed public vaccinator for the district. During the year I have been subjected to great trouble and arrogance from having to give certificates of death for their patients: indeed in some cases I felt disposed to let them form the subject of an inquest, especially in one of the ex-publican's cases, as, if he did not cause, he most assuredly accelerated the patient's death. Your Gazette would do good service in assisting to suppress this practice, as it has in other things.

I am yours, etc.,

MEDICUS.

[1] From the original in the Mitchell Library, Sydney.

Special Correspondence.

NEW ZEALAND LETTER.

FROM OUR SPECIAL CORRESPONDENT.

Consultative Committee on Hospital Reform.

THE Minister of Health, the Honourable J. R. Marshall, has appointed a Consultative Committee on Hospital Reform with a wide order of reference, and hopes to receive its report in a few months' time. The chairman is H. E. Barrowclough, of Auckland, barrister and solicitor, and the two medical members are D. S. Wylie, of Tauranga, and P. P. Lynch, of Wellington. The other three members, H. W. Shove, C. A. Campion and H. S. Williams, are business men with administrative experience in hospital affairs. The committee has announced an itinerary and called for submissions.

The precipitating influence in this step is probably the imminence of the disapearance of local rating from hospital finance, and the assumption by the Government of full responsibility. The system of 37 local hospital boards will thus become an anachronism. There has been discussion by the Minister, the Hospital Boards' Association and others about regionalization, and the issue of block grants to larger regional boards. The constitution of boards comes up also. At present all members are elected by popular vote. The position of the Health Department will be reviewed. At present it shares with the local boards the responsibility for hospital planning and provision.

The inquiry will be followed with much public interest and also hope that a system more suited to the present day may be achieved.

Birthday Honours.

Two medical men were included among the recipients of Birthday Honours in New Zealand.

Sir Francis Gordon Bell, K.B.E., retired at the end of 1952 from the chair of surgery at Otago University, Dunedin. He was recently President of the Royal Australasian College of Surgeons.

P. Stanley Foster, C.M.G., is well known as a surgeon in Christchurch, and as a member of the Hospital Board. For some years he has been chairman of the Medical Council.

NORTH AMERICAN LETTER.

FROM OUR SPECIAL CORRESPONDENT.

THE decision, reported in THE MEDICAL JOURNAL OF AUSTRALIA, to set up a scholarship in Adelaide as a memorial to the late Sir Hugh Cairns will be welcomed nowhere more than in North America. Sir Hugh had friends in many parts of the world, but especially so in the New England States where he trained under Harvey Cushing. There his memory is green, not only because of his neurosurgical triumphs, but because every student loves to relate the story of his arrival at the Peter Bent Brigham Hospital. Hardly had Cairns announced himself to the faithful operating room assistant, Adolf, than he heard his master's voice: "Get in here, Cairns, where have you been all this time?" The tale runs that Cairns was able to get back to the railway station six weeks later to collect his luggage.

From Cushing Cairns learned more than neurosurgery. He learned to work long hours and to keep his colleagues interested in equally long hours. He had a foretaste of what opposition to meticulous time-consuming neurosurgery he might expect in his later life, as he listened to Cushing's accounts of his early years in Baltimore, when neurosurgery

was thought to be a classic lost cause. Although Cairns was not as "exophthalmic with bibliomania" as Cushing, he shared a common interest in the history of medicine, later to be indulged in his Oxford professorial years.

It was that unique blend of Sherringtonian calm and Cushing drive which enabled Cairns, the Australian, to scale the surgical walls of London and to bring to fruition the uniquely British seed sown long since by Victor Horsley. Cairns had many of Horsley's attributes: as a surgeon he could see further than the scalpel in front of him; he was a soldier and strove to bring to the troops in the most remote stations the best that neurosurgery could offer; and possibly the most reminiscent of all, he was interested in students, whose pathway he both illuminated and smoothed, with a paternal pride and a complete and typically Australian disregard for alleged difficulties.

Cairns's translation to Oxford as the first Nuffield Professor of Surgery was the signal for a set of changes regarded as "impossible" by those knowing something of the inertia of that ancient foundation. Work and more work went into the conversion of wards and laboratories to make a unique establishment, with Cairns on the surgical wicket, Pio del Rio-Hortega covering the neuropathological end, and Pennybacker, the American, in the middle.

On Sundays, in summer time, picnics to the lovely environs of Oxford were Cairns's favourite indulgence. He and Don Pio would act as judges of the mock "bullfights" which the younger generation would stage, using dead branches of trees as "horns". The return trip to Oxford always led through several rural churchyards, where the architecture would be discussed in English and Spanish at length.

One wonders as to the influences which determined Cairns in his selection of his life's work. The uninitiated might think that coming from a "new country" such as Australia, Cairns would have little neurological background. They would be very wrong in this assumption, as Sir Hugh was always swift to make clear. In fact, one could not long be associated with him without realizing what a distinguished line of contributors to neurological science has stemmed from Australia.

In the field of architectonics A. W. Campbell's name ranks with those of Vogt, Brodmann and von Economo. Few country towns in Australia have been memorialized as Grafton has been in her native son G. Elliot Smith, whose fertile mind was applied so successfully to the phylogeny of the nervous system. Neuroanatomy today has a remarkable representation in Australia's medical schools, in Abbie and Sunderland, and in Burkitt, who has one of the world's finest neurological libraries.

Neurophysiology never had a more productive exponent than J. C. Eccles, and it is to be hoped that his new laboratories at Canberra will attract as many overseas students as his earlier laboratories at Oxford and Dunedin did. The late lamented Gilbert Phillips, and before him John Irvine Hunter, combined the physiological and surgical approaches. Cotton, Morson, McIntyre, J. M. Hunter, Bishop and the late Geoffrey Trahair have carried the torch in applied neurophysiology and Adey in clinical neurology. In the chemistry of myelin, Rossiter has made real advances. In pathology, the pioneer work of the inimitable Oliver Latham, a pupil of Ford Robertson, is unique. His colleague, Keith Inglis, has formulated a far-reaching hypothesis on the growth-governing function of the nervous system.

The contributions to the pathological literature by Leonard Cox, of Melbourne, by the Sydney neurosurgeon W. Lister Reid and by K. B. Noad are well known abroad. The recent award of a Rockefeller Travelling Fellowship to Dr. Brian Turner, of Sydney, to undertake neuropathological studies at the Institute of Neurology in London, must be a matter of great satisfaction to the Sydney neurological group.

In the diagnostic field the work of Graeme Robertson is universally known. In the literature of pain, Michael Kelly's work from Melbourne is gaining recognition. In poliomyelitis the names of Sir Macfarlane Burnet, Macnamara and Hamilton are associated with classical studies. Finally, and to bring the wheel full circle, was there ever a more fruitful collaboration developed than that between Sir Howard Florey and Sir Hugh Cairns in the development of antibiotics against infections of the nervous system?

Thus it is that your correspondent hopes that Australia's memorial to a great native son will be the permanent provision of funds with which to water and sustain the neurological productivity of the country. As the foregoing may have served to show, however incompletely, Australian neurology has both the seed and the soil.

Post-Graduate Work.

THE MELBOURNE PERMANENT POST-GRADUATE COMMITTEE.

PROGRAMME FOR JULY.

Courses for Higher Qualifications.

A SHORT COURSE on principles of pathology, suitable for candidates for the F.R.A.C.S. primary examination, will be conducted at the Pathology Department, University of Melbourne. Details will be published later.

Six lectures will be held on special pathology for candidates for the D.D.R. Part II (supplementary to the basic course), commencing on July 7 and continuing on Tuesdays, at 4.30 p.m.

Provided there are sufficient enrolments, a course on renal disorders, suitable for candidates for the M.D. Part II and M.R.A.C.P., will be held under the direction of Dr. Leslie Hurley on Tuesdays and Fridays, commencing at 2 p.m. on July 14, 17, 21, 24, 28 and 31. The fee for this course is £3 3s. Enrolments may be made for single demonstrations at pro-rata fees.

Courses in radiodiagnosis, psychiatry and bacteriology, which commenced in June, will be continued.

Enrolments.

Enrolments for the above courses should be made at least one week before commencement with the Melbourne Permanent Post-Graduate Committee, 394 Albert Street, East Melbourne. Telephone: FB 2547.

Country Courses.

Mooroopna.

A week-end course will be held at Mooroopna on July 18 and 19. The programme is as follows:

Saturday, July 18: 2.30 p.m., Dr. C. N. DeGaris, "Modern Ideas in the Management of Pregnancy"; 8 p.m., Dr. E. E. Dunlop, "Recent Advances in Surgical Practice".

Sunday, July 19: 10.15 a.m., Dr. J. G. Hayden, "The Management of Essential Hypertension"; 11.30 a.m., Dr. J. Billings, "Common Neurological Problems".

Enrolments for this course should be made with Dr. B. R. Schloeffel, Maud Street, Shepparton. The lecture on Saturday evening will be at the Grosvenor Hotel, Shepparton; all others will be at the Mooroopna Base Hospital.

Camperdown.

At Camperdown, on July 25, Dr. G. C. DeGruchy, will conduct a demonstration on anæmias. Enrolments should be made with Dr. W. R. Angus, Koroit Street, Warrnambool.

Fees.

Fees for country demonstrations are at the rate of 15s. Those who have paid an annual subscription to the Post-Graduate Committee are invited to attend without further charge.

THE POST-GRADUATE COMMITTEE IN MEDICINE IN THE UNIVERSITY OF SYDNEY.

Course in the Basic Medical Sciences.

THE Post-Graduate Committee in Medicine in the University of Sydney announces that an alteration has occurred in the commencement date of the course of lectures in the basic medical sciences, which will be suitable for candidates for the primary F.R.A.C.S. examination to be held in Sydney in November, 1953. The course will now begin on July 20, for a period of twelve weeks. The first nine weeks of the course will consist of afternoon lectures, the remaining three weeks from September 21 consisting of seminars in anatomy, physiology and pathology to be held in the mornings, as well as afternoon sessions.

On August 17 courses suitable for candidates for Part I of the D.A., D.G.O., D.L.O. and D.O. will begin and will continue until November 6.

Those interested in attending any of these courses are asked to communicate with the Course Secretary. The Post-Graduate Committee in Medicine, 131 Macquarie Street, Sydney, as soon as possible. Telephones: BU 5238, BW 7483. Telegraphic address: "Postgrad, Sydney."

Annual Subscription Course.

A course of lectures on the "Scientific Basis of Medical Practice" is being organized for inclusion in the annual subscription course from August to November, 1953. Further details will be announced shortly.

The annual subscription course covers attendance at lectures by overseas visiting lecturers. An annual charge of £2 2s. covers all such lectures during the year from July 1 to June 30, but excludes special courses. It does, however, include other specially arranged activities. Fee for resident medical officers is £1 1s. Subscriptions to the annual subscription course are deductible for taxation.

Those wishing to make enrolment for the year beginning July 1, 1953, are requested to forward their remittance to the Course Secretary, The Post-Graduate Committee in Medicine, 131 Macquarie Street, Sydney.

THE POST-GRADUATE COMMITTEE IN MEDICINE IN THE UNIVERSITY OF SYDNEY, IN CONJUNCTION WITH THE ROYAL COLLEGE OF OBSTETRICIANS AND GYNÆCOLOGISTS.

Course in Obstetrics and Gynæcology.

THE Post-Graduate Committee in Medicine in the University of Sydney, in conjunction with the Royal College of Obstetricians and Gynæcologists, announces that a course in obstetrics and gynæcology by the staff of The Women's Hospital, Crown Street, Sydney, will be held from August 31 to September 4, 1953. A full programme has been arranged, consisting of operative demonstrations and discussions from 8.30 to 10.30 each morning, followed by lecture-demonstrations, with ward rounds, discussion of clinical cases and pathology.

The course will be limited to twenty post-graduate students in residence and nine attending as external students. Fees for attendance are £8 18s. 6d. (including board and residence), or £6 6s. (external attendance).

Candidates should take up residency on Sunday afternoon, August 30.

Application should be made in writing to the Course Secretary, The Post-Graduate Committee in Medicine, 131 Macquarie Street, Sydney, stating whether it is for attendance as a resident or external student. Enrolment will be made in order of receipt of fees, and the list will be closed as soon as the required number of applications is received. Telephones: BU 5238, BW 7483. Telegraphic address: "Postgrad, Sydney."

Obituary.

LEO DOYLE.

DR. F. J. COLAHAN writes: The sudden death of Mr. Leo Doyle on March 3 has left a gap in the ranks of the medical profession which will not easily be filled.

Leo Doyle was a general surgeon in the true sense of the word, and there were few operations in surgery, highly specialized or otherwise, which he could not execute with the supreme artistry of the master craftsman. One was left wondering and astonished at his surgical versatility and the amazing physical strength and stamina which he displayed in regularly performing long lists of big operations. In addition to remarkable skill, he possessed great courage and tenacity; possibly because of these attributes he excelled in cancer surgery, and in no part of the world have I seen his superior, and seldom his peer, in this branch of surgery. A shy and sensitive person, Leo Doyle did not seek the limelight, and it says much for the brilliance of his surgical technique that the limelight sought him out. Himself possessed of tireless energy and enthusiasm, he did not tolerate slackness or indifference in those serving under him, but to the student or resident medical officer who was keen and anxious to learn he spared no effort.

To anyone knowing Leo Doyle it was no surprise to learn of the diversity of his interests and recreations. Golf, in which he was a low mark player, was his principal sport, but latterly, possibly on account of his progressive disability, he played less golf and interested himself in a model stud farm which he had at Frankston. It was here that

DISEASES NOTIFIED IN EACH STATE AND TERRITORY OF AUSTRALIA FOR THE WEEK ENDED MAY 16, 1953.[1]

Disease.	New South Wales.	Victoria.	Queensland.	South Australia.	Western Australia.	Tasmania.	Northern Territory.[2]	Australian Capital Territory.	Australia.[3]
Acute Rheumatism	3(3)	4(3)	..	..	3(2)	..	..	..	10
Amœbiasis	..	..	..	..	..	..	..	..	..
Ancylostomiasis	..	..	13	..	..	..	..	..	13
Anthrax	..	..	..	..	..	..	..	..	..
Bilharziasis	..	..	..	..	..	..	..	..	..
Brucellosis	..	2(1)	..	..	..	..	..	..	2
Cholera	..	..	..	..	..	..	..	..	..
Chorea (St. Vitus)	..	2(2)	..	..	1	..	..	..	3
Dengue	..	..	..	..	1	..	..	..	1
Diarrhœa (Infantile)	5(4)	5(5)	8(5)	..	..	..	..	..	18
Diphtheria	12(6)	13(9)	3(1)	..	4(4)	1	..	..	33
Dysentery (Bacillary)	..	..	..	10(1)	5	..	..	..	15
Encephalitis	..	1(1)	..	..	..	..	..	..	1
Filariasis	..	..	..	..	..	..	..	..	..
Homologous Serum Jaundice	..	..	..	..	..	..	..	..	..
Hydatid	..	2	..	..	..	..	..	..	2
Infective Hepatitis	..	12(3)	..	..	8(6)	..	..	..	20
Lead Poisoning	..	..	..	..	..	..	..	..	..
Leprosy	..	..	..	..	..	..	..	..	..
Leptospirosis	..	..	7	..	..	..	..	..	7
Malaria	..	..	..	..	..	..	..	..	..
Meningococcal Infection	2(2)	5(2)	1	..	1	2(1)	..	..	11
Ophthalmia	..	..	..	..	16	..	..	..	16
Ornithosis	..	1(1)	..	..	..	..	..	..	1
Paratyphoid	..	..	..	..	..	..	..	..	..
Plague	..	..	..	..	..	..	..	..	..
Poliomyelitis	7(5)	1	5(2)	11(5)	1	..	..	..	25
Puerperal Fever	..	..	1	..	..	..	..	..	1
Rubella	..	29(18)	..	..	5(1)	..	..	..	34
Salmonella Infection	..	..	..	..	..	..	..	..	..
Scarlet Fever	7(1)	100(53)	..	11(4)	..	1	..	..	119
Smallpox	..	..	..	..	..	..	..	..	..
Tetanus	..	..	1	..	..	..	..	..	1
Trachoma	..	..	..	..	..	..	..	..	..
Trichinosis	..	..	..	..	..	..	..	..	..
Tuberculosis	41(31)	14(10)	14(8)	8(5)	16(12)	1(1)	..	1	95
Typhoid Fever	..	1	..	..	..	..	..	..	1
Typhus (Flea-, Mite- and Tick-borne)	..	..	1	..	..	..	..	..	1
Typhus (Louse-borne)	..	..	..	..	..	..	..	..	..
Yellow Fever	..	..	..	..	..	..	..	..	..

[1] Figures in parentheses are those for the metropolitan area.
[2] Figures not available.
[3] Figures incomplete owing to absence of returns from the Northern Territory.

his final illness overwhelmed him. A keen interest in music, literature and painting made this man of so many parts the very fine gentleman that he was. The great Saint Patrick's Cathedral, where Requiem Mass was said for the repose of his soul, was thronged to the doors, a remarkable demonstration of the affection and esteem in which he was held by so many thousands. The manner of his death was in keeping with the man, for he willingly resigned himself to the end which he knew had come with the intrepid fearlessness and shining faith so characteristic of him. We, his colleagues at Saint Vincent's Hospital, mourn his death and offer our deepest sympathy to his widow and relations.

Naval, Military and Air Force.

APPOINTMENTS.

THE undermentioned appointments, changes *et cetera* have been promulgated in the *Commonwealth of Australia Gazette*, Number 30, of May 21, 1953.

PERMANENT NAVAL FORCES OF THE COMMONWEALTH (SEA-GOING FORCES).

Termination of Appointment.—The appointment of William McLaren Thomson as Surgeon Lieutenant (for Short Service) is terminated, dated 31st March, 1953.

ROYAL AUSTRALIAN AIR FORCE.

Air Force Reserve: Medical Branch.

The following former officers are appointed to commissions with the rank of Flight Lieutenant: B. O. Pierce (036123), 20th December, 1952, A. E. Daley (036121), 1st January, 1953.

The following are appointed to commissions with rank as indicated: (Flight Lieutenant (Temporary Wing Commander)) Lennard Gilmore Travers (257896), 16th February, 1953; (Flight Lieutenant) Ronald George Henry (257900), 26th February, 1953.

The following officers are placed on the Retired List, 13th February, 1953: Squadron Leader G. P. Arnold (1451); Flight Lieutenant (Temporary Wing Commander) K. G. Colquhoun (3232); Flight Lieutenants F. G. Middleton (3562), J. A. Shanasy (5935).

The appointment of Flight Lieutenant (Temporary Squadron Leader) A. S. Anderson (6714) is terminated, 14th February, 1953.

Deaths.

THE following deaths have been announced:

STOBO.—Jean Seldon Stobo, on June 4, 1953, at Brisbane.

LEVICK.—Claude Blaxland Levick, on June 5, 1953, at London.

MAGUIRE.—Frederick Arthur Maguire, on June 10, 1953, at Sydney.

Nominations and Elections.

THE undermentioned have applied for election as members of the New South Wales Branch of the British Medical Association:

Kramer, Edith Marie, provisionally registered in accordance with the *Medical Practitioners Act*, 1938-1950, Section 17 (1) (*c*), 1 Rose Crescent, Mosman.

Chambers, Roland George, B.M., B.Ch., 1948 (Univ. Oxford), 35 Simla Road, West Ryde.

The undermentioned have applied for election as members of the South Australian Branch of the British Medical Association:

Helme, Alan Crichton, M.R.C.S., L.R.C.P. (London), 1952, Karoonda, South Australia.

Riddell, Frank Scoular, M.B., B.S., 1953 (Univ. Adelaide) (qualified 1952), South Terrace, Kapunda, South Australia.

Earl, John Alfred, M.B., B.S., 1949 (Univ. Adelaide), 64 Hastings Street, Glenelg, South Australia.

Pulsford, Margaret Jean Bronte, M.B., B.S., 1940 (Univ. Sydney), 67 Oval Avenue, Woodville, South Australia.

Richardson, John Patrick, M.B., B.S., 1952 (Univ. Adelaide) (qualified 1951), 104 William Street, Norwood, South Australia.

The undermentioned have been elected as members of the South Australian Branch of the British Medical Association: Doddridge, Albert Keith, M.B., B.S., 1953 (Univ. Adelaide) (qualified 1952); Westphalen, Kenneth John, M.B., B.S., 1953 (Univ. Adelaide) (qualified 1952); Halloran, Noel, M.B., B.S., 1953 (Univ. Adelaide) (qualified 1952); Hamden, William Calill, M.B., B.S., 1953 (Univ. Adelaide) (qualified 1952); Symes, William David, M.B., B.S., 1952 (Univ. Adelaide) (qualified 1951).

Diary for the Month.

JUNE 23.—New South Wales Branch, B.M.A.: Ethics Committee.
JUNE 24.—South Australian Branch, B.M.A.: Annual Meeting.
JUNE 24.—Victorian Branch, B.M.A.: Branch Council.
JUNE 25.—New South Wales Branch, B.M.A.: Branch Meeting.
JUNE 26.—Queensland Branch, B.M.A.: Council Meeting.

Medical Appointments: Important Notice.

MEDICAL PRACTITIONERS are requested not to apply for any appointment mentioned below without having first communicated with the Honorary Secretary of the Branch concerned, or with the Medical Secretary of the British Medical Association, Tavistock Square, London, W.C.1.

New South Wales Branch (Medical Secretary, 135 Macquarie Street, Sydney): All contract practice appointments in New South Wales.

Victorian Branch (Honorary Secretary, Medical Society Hall, East Melbourne): Associated Medical Services Limited; all Institutes or Medical Dispensaries; Australian Prudential Association, Proprietary, Limited; Federal Mutual Medical Benefit Society; Mutual National Provident Club; National Provident Association; Hospital or other appointments outside Victoria.

Queensland Branch (Honorary Secretary, B.M.A. House, 225 Wickham Terrace, Brisbane, B17): Brisbane Associated Friendly Societies' Medical Institute; Bundaberg Medical Institute. Members accepting LODGE appointments and those desiring to accept appointments to any COUNTRY HOSPITAL or position outside Australia are advised, in their own interests, to submit a copy of their Agreement to the Council before signing.

South Australian Branch (Honorary Secretary, 178 North Terrace, Adelaide): All Contract Practice appointments in South Australia.

Western Australian Branch (Honorary Secretary, 205 Saint George's Terrace, Perth): Norseman Hospital; all Contract Practice appointments in Western Australia. All government appointments with the exception of those of the Department of Public Health.

Editorial Notices.

MANUSCRIPTS forwarded to the office of this journal cannot under any circumstances be returned. Original articles forwarded for publication are understood to be offered to THE MEDICAL JOURNAL OF AUSTRALIA alone, unless the contrary be stated.

All communications should be addressed to the Editor, THE MEDICAL JOURNAL OF AUSTRALIA, The Printing House, Seamer Street, Glebe, New South Wales. (Telephones: MW 2651-2.)

Members and subscribers are requested to notify the Manager, THE MEDICAL JOURNAL OF AUSTRALIA, Seamer Street, Glebe, New South Wales, without delay, of any irregularity in the delivery of this journal. The management cannot accept any responsibility or recognize any claim arising out of non-receipt of journals unless such notification is received within one month.

SUBSCRIPTION RATES.—Medical students and others not receiving THE MEDICAL JOURNAL OF AUSTRALIA in virtue of membership of the Branches of the British Medical Association in the Commonwealth can become subscribers to the journal by applying to the Manager or through the usual agents and booksellers. Subscriptions can commence at the beginning of any quarter and are renewable on December 31. The rate is £5 *per annum* within Australia and the British Commonwealth of Nations, and £6 10s. *per annum* within America and foreign countries, payable in advance.